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Measuring Weekly Changes in the Wholesale and Retail Movement of

APPLES

U.S. Department of Agriculture
Marketing Research Division
Agricultural Marketing Service
Washington, D.C.

Marketing Research Report No. 351

PREFACE

This is the third and last of a group of reports summarizing data on changes in the weekly movement of apples at wholesale and retail during the 1955-56 and 1956-57 marketing seasons. During both seasons, the retail study was conducted in Philadelphia. In 1955-56, the wholesale study was conducted in Philadelphia, Chicago, Atlanta, and Los Angeles; in 1956-57 in Philadelphia and Chicago. The first report, "Weekly Changes in Movement of Apples--Selected Markets, 1955-56 Marketing Season Through Dec. 31, 1955," AMS-91, was released in February 1956. The second report, "Measuring Weekly Changes in the movement of Apples and Winter Pears, 1955-56 Marketing Season," AMS-148, was released in February 1957. The study is part of a broad program of research designed to reduce the cost of marketing farm products.

The project was conducted in the Agricultural Marketing Service by the Market Development Branch, Marketing Research Division, in close collaboration with the Office of Statistical Clearance and Standards, and with the aid of the Market News Branch, Fruit and Vegetable Division, in collecting wholesale data. The retail store information is based on data collected by Audits and Surveys Company, Inc., under contract with the U. S. Department of Agriculture.

The preliminary findings of the Northeastern Regional Marketing Project NEM-9, "Factors Affecting the Rate of Movement of Apples into Consumption," conducted by land grant colleges in Northeastern States, were utilized in designing and drawing up the detailed procedures for conducting this study.

Many retail store managers and receivers in terminal markets cooperated in supplying data. The following persons contributed to the early planning of this research: Harold Copple, former secretary-manager, Washington State Apple Commission; R. A. Patterson, executive secretary, Oregon-Washington-California Pear Bureau; Carrol R. Miller, secretary manager, Appalachian Apple Service, Inc.; W. J. Klotzbach, former executive secretary, Western New York Apple Growers Association, Inc.; Truman Nold, executive secretary, National Apple Institute; and Fred Burrows, executive vice president, International Apple Association.

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September 1959

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Washington 25, D. C. - Price 35 cents

MEASURING WEEKLY CHANGES IN THE WHOLESALE AND RETAIL MOVEMENT OF APPLES

By Peter L. Henderson and Sidney E. Brown, agricultural economists
Market Development Branch

SUMMARY

The study was conducted to (1) determine whether it is feasible to measure week-to-week changes in the wholesale and retail movement of apples, and (2) ascertain the most appropriate technique for accomplishing this task from the standpoints of cost, value of the data, accuracy, and timeliness. Shippers in the major producing areas had stated such information for a number of key markets about the country would be a valuable supplement to data on unloads of apples and would provide marketing agencies a sounder basis for making marketing decisions. The retail analysis covers Philadelphia; the wholesale analysis covers Philadelphia and Chicago.

At retail, fluctuations or changes in estimated weekly sales in small stores generally followed the same pattern as the fluctuations in large stores. The relationship appeared to be close enough to use sales in large stores as an index of total movement for reporting changes in retail apple sales.

The audit and observation methods (as used in this study) for collecting movement data in large retail stores were found to be about equal in accuracy; however, the estimated cost of collecting retail movement data is almost twice as much for the observation method as for the audit method--$35,000 versus $20,000 per market per year, using a sample of 100 large stores. The findings showed that a sample of 100 stores would be necessary to estimate percentage changes in sales in the large stores with a standard error of estimate no greater than 4 percent for these two methods.

A more efficient method for collecting movement data from large stores was discovered during the analysis of the sales data collected by audit. An almost perfect correlation was found between apple receipts and apple sales in large stores, with a correlation coefficient of receipts on sales of 0.98. Not only would costs be reduced by estimating receipts only, but greater accuracy could be obtained because data on receipts could be collected from a larger number of retail stores by going directly to corporate and voluntary chain warehouse records. A few unaffiliated independent retailers would have to be visited to round out the sample. The estimated cost of collecting data and reporting changes in retail movement by this method would be approximately $6,000 to $7,500 per market per year, compared to $20,000 per market per year for collecting sales data by the audit method. The

information, moreover, could be released in a more timely fashion. A report furnishing information on changes in the weekly volume of apples received by the stores in a market could be released to the trade on Tuesday of the following week, whereas reports of changes in movement based on audited sales could not be compiled and released earlier than Friday or possibly Saturday of the week following the actual change.

Wholesale movement and inventory data were collected from first-hand receivers (including chain organizations) in the Philadelphia and Chicago markets. These data provide information on the general trend in retail apple movement and changes in holdings of primary wholesalers. Such information is relatively inexpensive to collect and report. The estimated cost per market would be about $3,000 per market per year. This type of information would to a large degree fill a void in current market news information--specifically the volume of apples held by primary terminal market receivers. However, due to time lags associated with inventory adjustments of secondary wholesalers and institutional outlets, these data do not reflect immediate changes in consumption. Moreover, they show wide fluctuations in movement from week to week, and are not too dependable as guides to the current strength or weakness in market demand.

Supplemental information was obtained from apple shippers in major commercial producing areas and buyers in the Philadelphia market concerning factors they considered in making marketing decisions and the information used to evaluate the factors considered.

The majority of apple handlers interviewed indicated that their primary considerations were the supplies of apples to be marketed and the rate and prices at which apples were currently moving into consumption. The primary sources of information concerning seasonal and long-term supplies--crop production reports and cold storage reports--were considered to be adequate by those interviewed. 1/ However, most shippers and some chain buyers who sell and buy in large volume felt that the summaries of truck and rail unload data were not adequate for reflecting current movement into consumption. Commission merchants in Philadelphia who draw supplies and obtain overnight delivery from shippers in nearby producing areas were not concerned with published information on movements for Philadelphia or other terminal markets. Such dealers indicated that they were aware of the movement of apples in Philadelphia and were not materially affected by movement in other terminal markets. The brokers interviewed were interested in published information as a check only on information obtained from shippers and brokers in other markets.

1/ Issued by the Crop Reporting Board of the U. S. Department of Agriculture, and the International Apple Association which makes independent estimates.

BACKGROUND

This study was initiated at the request of producer groups in important commercial apple-producing areas, namely, the Washington State Apple Commission and State Horticultural Societies of New York, Pennsylvania, Virginia, and West Virginia, to determine the feasibility of supplementing weekly unload data for apples with data on the weekly rate of movement at wholesale and retail levels in key markets about the country.

In requesting this service, the producer groups stated that rail and truck unloads in markets were not adequate for reflecting movement into consumption in terminal markets because substantial supplies were purchased by speculators and other buyers for future needs. Such apples move into storage rather than into consumption and the magnitude of this movement is not generally known until the next storage report is released. Thus, unrealistic price fluctuations were said to occur frequently as a result of incomplete information. Shippers felt that they were sometimes at a disadvantage in making decisions because buyers in terminal markets were in a better position to obtain first-hand knowledge of such holdings. This was borne out in part by the comments of wholesale representatives who were asked to cooperate in providing data for the study. Generally, the wholesalers in a market indicated that they were aware of changes in wholesale movement almost immediately, and stated that any benefits of movement reports could only go to shippers.

In the 1955-56 marketing season, weekly wholesale disappearance reports were made available to the trade on a trial basis by the Market News Branch of the Fruit and Vegetable Division, Agricultural Marketing Service, U. S. Department of Agriculture, for four markets. These markets--Atlanta, Ga., Chicago, Ill., Los Angeles, Calif., and Philadelphia, Pa.--were selected to give a broad geographical coverage. The inclusion of Philadelphia made it possible to compare the wholesale movement data with similar information being collected at retail in that market as part of this research.

Wholesale data were obtained by standard audit methods from first-hand receivers in each market and encompassed the total sales (within and outside the market) of these agencies. 2/

Retail movement data in the 1955-56 season were obtained from a representative sample of 60 self-service retail food stores having 2 or more checkout counters in Philadelphia, Pa. Apple sales data were collected from each retail food store by both the observation and audit methods. 3/

2/ Standard audit method: (beginning inventory + weekly receipts) — (ending inventory + transfers + withdrawals + spoilage) = sales.

3/ See appendix for allocation of observation periods.

Neither of the methods employed in collecting retail sales data (audit and observation) was judged to be sufficiently accurate for reporting week-to-week changes in retail movement, but the results were encouraging enough to merit continuing the work the following season, and they contributed significantly to refining methodology. The audit method of collecting movement data was generally superior to the observation method as the study was designed, but the relative advantage was not so great in the larger stores.

The wholesale disappearance data showed the general trends in apple movement in the Philadelphia market, but there did not appear to be any relationship between the weekly changes in wholesale disappearance and retail sales in that market, though for the season as a whole both series exhibited similar trends.

PROCEDURE

Retail Sales Data

The design of the 1956-57 retail apple movement study was based in considerable part on the findings of the 1955-56 work in the Philadelphia market. That is, stratification and allocation of the sample to strata were determined on the basis of the variance in apple sales associated with factors such as store size, time of day, and customer traffic found in the previous year's study.

The study was designed to show week-to-week changes in movement of major eastern and western varieties and the percentage of stores which offered major varieties. Provisions were also made to obtain information on prices and condition by variety on a weekly basis.

A double sampling procedure was utilized in selecting the stores to be used in collecting movement data. Initially, a preliminary survey using a probability sample of 612 of the approximately 8,500 food stores in the Philadelphia metropolitan area was conducted to determine the number, size, and type (service or self-service) of food stores that carried produce.

Newspaper route lists and area sampling procedures were used in selecting the 612 stores surveyed. The area sampling technique was used to correct the route list for store closings and openings. The sampling rate in the preliminary survey was 1 store out of 14 stores in the entire population included on the newspaper route list.

It was found that 293 of the 612 stores surveyed had fresh produce counters, of which 160 had total weekly sales less than $1,000; 85 had total weekly sales of $1,000 to $6,000; and 48 had total sales of $6,000 and over

per week. Thus, on the basis of the sampling rate used in the survey, it was estimated that of the 8,500 retail grocery stores in Philadelphia, 4,102 had fresh produce counters. The estimated total number of stores having fresh produce counters classified by size (weekly dollar volume of sales) was as follows: Less than $1,000--2,240 stores; $1,000-$6,000--1,190 stores; and $6,000 and over--672 stores. The findings of the distribution study also showed that all of the large stores offered produce, whereas only about one-third of the small stores (less than $1,000 weekly sales) had produce counters.

Supplemental information was obtained in the preliminary study on characteristics of the stores such as weekly customer count and slow, medium and busy hours of customer activity.

A stratified random sample of 100 stores was drawn from the 293 stores having fresh produce counters to measure changes in movement (table 1). The sample was stratified, using optimum allocation. The initial selection of stores was made on the basis of weekly dollar sales of the stores by multiplying the square root of the midpoint of each sales volume group by the number of stores in each group and determining the theoretical percentage distribution as shown in table 2. Self-service stores selected in the sample having weekly sales of $6,000 and over were included in the observation category, while all service stores, and self-service stores having weekly sales less than $6,000, were included in the audit strata (table 3). There were only 43 self-service stores having a weekly volume over $6,000; thus, the total sample of 100 stores was divided into 59 stores to be surveyed on an audit basis and 41 stores by the observation procedure.

Some adjustments were necessary in the actual allocation in order to insure representation of some groups of stores (tables 3 and 4). In some instances, the theoretical distribution called for more stores in specific groups than were found in the distribution study. For example, 16 self-service stores having weekly sales of $40,000 and over theoretically should have been included in the sample, while only 9 were available in this category. Likewise, based on the theoretical allocation no stores having weekly sales of less than $200 would have been included in the sample--in the actual allocation, one was included to insure representation of this group (table 3).

The observations in the 41 stores were further stratified according to busy, medium, and slow periods of customer activity based on the number of observation periods in each category (determined from previous year's study and the preliminary survey) and the sampling variation in apple sales associated with each period of customer activity found in the previous year's study. The observation hours were then allocated by customer activity and size of store strata as nearly proportional to the theoretical allocations as possible, considering the number of stores available in each group (table 4). This

Table 1.--Food stores surveyed in the Philadelphia metropolitan area selling fresh produce, by type of store and value of weekly sales, October 1956 1/

Weekly sales	Self-service	Service	Total
	Stores	Stores	Stores
$100 and less	---	1	1
$100-$200	1	3	4
$200-$400	8	30	38
$400-$600	18	32	50
$600-$1,000	37	30	67
$1,000-$2,000	21	32	53
$2,000-$6,000	23	9	32
$6,000-$10,000	14	3	17
$10,000-$20,000	11	1	12
$20,000-$30,000	4	1	5
$30,000-$40,000	5	---	5
Over $40,000	9	---	9
Total	151	142	293

1/ Newspaper route lists and area sampling procedures were used in selecting the 612 stores surveyed. The area sampling technique was used in connection with the route list in order to correct the route list for store closings and openings. The sampling rate in the distribution study was 1 store out of 14 stores in the entire population included on the newspaper route list.

Table 2.--Actual and weighted distribution of sample stores selling produce, by value of weekly sales, Philadelphia, Pa., 1956

Weekly sales	Number of stores	Midpoint of sales volume group	Square root of midpoint of sales volume group	Weighted distribution of stores 1/	Percentage distribution by sales volume 2/
	Stores	Dollars	Dollars	Dollars	Percent
$100 and less....	1	100	10.00	10.00	0.1
$100-$200.....	4	150	12.25	49.00	.3
$200-$400.....	38	300	17.32	658.16	4.4
$400-$600.....	50	500	22.36	1,118.00	7.5
$600-$1,000.....	67	800	28.28	1,894.76	12.7
$1,000-$2,000....	53	1,500	38.73	2,052.69	13.7
$2,000-$6,000....	32	4,000	62.24	1,991.68	13.3
$6,000-$10,000...	17	8,000	89.44	1,520.48	10.2
$10,000-$20,000..	12	15,000	122.47	1,469.64	9.8
$20,000-$30,000..	5	25,000	158.11	790.55	5.3
$30,000-$40,000..	5	35,000	187.08	935.40	6.2
Over $40,000.....	9	75,000	273.86	2,464.74	16.5
Total.....	293	---	---	14,955.10	100.0

1/ Number of stores weighted by square root of the midpoint of each sales volume group.

2/ Percentage based on weighted distribution of stores.

Table 3.--Theoretical and actual allocation of a sample of 100 stores: Audit and observation strata, by value of weekly sales, Philadelphia, Pa., October 1956

Weekly sales	Number of stores surveyed	Theoretical			Actual		
		Total	Audit	Observation	Total	Audit	Observation
	Stores	Stores	Stores	Stores	Stores	Stores	Stores
$100 and under....	1	---	---	---	---	---	---
$100-$199.....	4	---	---	---	1	1	---
$200-$399.....	38	5	5	---	4	4	---
$400-$599.....	50	8	8	---	8	8	---
$600-$999.....	67	13	13	---	13	13	---
$1,000-$1,999.....	53	14	14	---	14	14	---
$2,000-$5,999.....	32	13	13	---	14	14	---
$6,000-$9,999.....	17	10	3	7	15	3	12
$10,000-$19,999...	12	10	1	9	12	1	11
$20,000-$29,999...	5	5	1	4	5	1	4
$30,000-$39,999...	5	6	---	6	5	---	5
Over $40,000.....	9	16	---	16	9	---	9
Total.....	293	100	58	42	100	59	41

Table 4.--Number of stores observed during selected periods of customer activity, by value of weekly sales, Philadelphia, Pa., October 1956

Weekly sales	Customer activity			
	Busy	Medium	Slow	Total 1/
	Stores	Stores	Stores	Stores
$6,000-$9,999.....	10	1	1	12
$10,000-$19,999...	9	1	1	11
$20,000-$29,999...	2	1	1	4
$30,000-$39,999...	4	1	---	5
$40,000 and over..	6	1	2	9
Total 2/.....	31	5	5	41

1/ From table 3.

2/ From computations based on total hours stores were open, classified by customer activity from distribution study, and estimated sampling variation of apple sales for busy, medium, and slow periods of customer activity from previous year's study. See appendix.

manner of allocation minimized sampling errors in the estimates of total retail movement of apples in the Philadelphia market. 4/

The combination of procedures (audit in the smaller stores and observation in the larger stores) for collecting information on apple sales was followed because (1) the previous year's experience showed that the relative advantage in statistical precision of the audit method over the observation method was not significant for large stores, and (2) obtaining sales data from observation in large stores minimized the possibility of bias due to refusal of some stores to cooperate in using the audit method. 5/

To make comparisons of the relative precision of the observation and audit procedures for collecting movement data, audits of sales were made in 40 of the 41 large stores for a period of 8 weeks.

In addition, the 40 stores were divided into 2 randomly drawn subsamples of 20 stores each to determine the accuracy of information obtained from the large stores by the audit method on a weekly versus a daily basis. Audits of inventories, receipts, waste, and returns were made daily in 1 sample of 20 stores and weekly in the other sample of 20 stores.

In the 59 stores in which weekly sales data were collected by the standard audit method, inventories of apples were taken in each store on the same day each week (Monday, Tuesday, or Wednesday). At the time inventories were taken, data by varieties and regions of origin were obtained on the receipts, spoilage, withdrawals, and transfers covering the interinventory period. Spot prices were obtained from the audit stores at intervals throughout each week and averaged for each variety. The sales data were combined with movement estimates obtained by observation and the combined figures were made available by principal varieties and areas of origin to the trade on Monday or Tuesday of the following week.

In recording sales of apples by the observation method, each store was visited once each week. Enumerators followed a regular schedule in making observations and were in sample stores three-fourths of 1 hour during busy periods of customer activity, 1-1/2 hours during periods of medium or average customer activity, and 2-1/2 hours during periods of slow customer activity throughout each week. 6/

4/ See appendix for method of computing allocation of observation by periods of customer activity.

5/ Managers of large stores were less willing to cooperate in furnishing sales information than the small stores when the audit method was employed because of the greater amount of work involved in maintaining records. On the other hand, they were willing to cooperate when the observation method was used.

6/ The findings of the previous year's study showed that length of observation periods should be varied for greatest efficiency and precision, and that the times stated above were optimum for the slow, medium, and heavy periods of customer activity.

During each observation period, enumerators collected data on the following items:

1. Variety of apples displayed by region of origin and price per pound
2. Number of displays by size and type (bulk, package, or both)
3. Number of apple purchases
4. Pounds of apples purchased by variety and region of origin, package or bulk, and price per pound
5. Weather during observation period
6. Number of customer units passing apple displays (customer unit = 1 person shopping alone or 2 or more shopping together)
7. Condition of apples on display, rated good, poor, or fair

These data were summarized and part of them were included in the weekly reports issued to the trade. The weekly reports included 1, 6, and 7 above and part of 4 (pounds purchased by variety and region of origin).

Wholesale Sales Data

The wholesale movement data were collected from first receivers (including chain organizations) and institutions in each market in an attempt to secure complete coverage of wholesale movement within the markets. However, it was not possible to segregate sales made by the first receivers to secondary wholesalers from sales to retailers outside the metropolitan markets covered. Also, direct purchases by secondary wholesalers and independent retailers from producers and hucksters (itinerant truckers) were not included in these data.

The wholesale agencies furnished records of inventories and weekly receipts by varieties from which the wholesale disappearance (sales and spoilage) data were calculated.

Factors Considered and Information Used by Shippers and Buyers in Making Marketing Decisions

Data concerning the factors considered and sources of information used by shippers and buyers were obtained from a representative sample of apple shippers located in the Pacific Northwest, Appalachian, and New York-New England producing areas as defined in monthly crop production reports issued by the Agricultural Marketing Service, and from wholesale merchants in the Philadelphia market. The primary sample and two alternate samples were drawn from shippers and buyers listed in the "Produce Reporter's Blue

Book." 7/ The sample of shippers was stratified by area and by type and size of shipper (according to the Blue Book classification), to insure representation of all groups. Wholesale dealers in Philadelphia were selected and stratified in a similar manner. The overall sampling rate among shippers was 21 percent. The rate varied between the substrata from 5 to 100 percent. The sampling rate was lowest in the small grower-shipper stratum because of the large number of shippers in this category, and many such shippers actually sell their fruit through shipping-point brokers or sales agents. In strata which contained only a small number of shippers the rate was increased up to 100 percent coverage. For example, if only two large shipping-point brokers were found in an area, both were contacted, or if three were found, two of the three were interviewed.

The sample contained 39 grower-shippers, 28 buyer-shippers, and 16 shipping-point brokers or sales agents--a total of 83. Forty of the shippers were located in Idaho, Oregon, and Washington; 24 in Maryland, Pennsylvania, Virginia, and West Virginia; and 19 in New York and New Jersey. 8/ By size classification, 38 were large, 37 were medium, and 8 were small. 9/

The sampling rate of the wholesale merchants (including chain buyers) was much higher than for the shippers because of the smaller number of wholesalers. Thirty wholesale merchants out of a total of 72 were included in the sample.

The questions including the schedules were designed to obtain data on the usefulness of the movement report to the trade, the adequacy of available market information, and the method of operations (sales and procurement policies) of the shippers and buyers which might influence their use of or desire for specific items of information.

WHOLESALE AND RETAIL MOVEMENT

Criteria for Evaluation of Methods of Data Collection

Factors considered to be most important in evaluating the efficiency of different methods of measuring movement include: (1) The cost of obtaining and processing data in relation to their value; (2) the amount of supplemental information obtained and its value; (3) the time lag between collection of sales data and release of reports covering sales; and (4) the accuracy of

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7/ Published by the Produce Reporter Company, 1958.

8/ The strata for shippers were grower-shipper, buyer-shipper, and shipping-point brokers (sales agents for growers). The size classifications were large, medium, and small. The strata for wholesale merchants were wholesale buyers, commission merchants, jobbers, and terminal market brokers. Numbers were assigned in sequence to the primary and alternate samples beginning with 1 to the shipper for each of the samples (1, 1-a, 1-b, 2, 2-a, 2-b, etc.). Thus, 2 alternates were drawn for each shipper appearing in the primary sample.

9/ Size was classified according to volume shipped annually: Large, over 500 cars; medium, 101-500 cars; small, 100 cars and less.

movement reports (estimates of total movement) based on the different collection methods.

Each of these factors has several facets--some of which are relative in nature and can be evaluated only on a judgment basis, while others can be evaluated by precise mathematical measurement. The latter, in this case, is rather technical. Therefore, a brief discussion of each of the criteria involved in the evaluation is given here.

Cost of Reporting

The total cost of a method for reporting movement must be considered in relation to the value of the information obtained. The difficulty in comparing the relative cost of methods for reporting information of any type is directly related to the difficulty of appraising the value of the information reported. It is seldom that one is able to assign quantitative measures of the value of the information to users. Thus, the relative value is most often a matter of judgment, and the criteria for making such evaluations are not always apparent, or easily defined.

At the time the study was initiated, the extent the trade used or would use information on movement and on factors affecting movement was not definitely known. Therefore, the survey of shippers and handlers (discussed in detail in another section of this report) was made to determine the factors they considered in making marketing decisions, as an aid in evaluating methods for collecting movement data.

Supplemental Information

The supplemental information which can be readily obtained in collecting information for measuring movement may be as important as the movement information. Information such as changes in merchandising practices, prices, condition, and quality, and other factors associated with changes in movement provides a basis for redirecting marketing and promotion programs by industry groups.

Time Lags

The length of time required to collect, process, and release movement reports is of vital importance to all segments of the trade. To be of most value to the industry, reports indicating changes in consumption should be available with a minimum delay--if possible, within the week following a change in movement--to allow the industry to take remedial action before the movement and possibly prices get out of hand.

Timely information on changes in movement into consumption in key markets in the major consuming areas would provide a basis for making decisions concerning price adjustments and for special sales efforts to minimize losses due to deterioration in quality or extreme short-time wholesale price fluctuations.

Accuracy

Movement information must be reliable to be of benefit to the trade. Uncertainty or lack of knowledge concerning supply and demand factors affecting prices contributes to inefficiencies and added cost in the marketing system. Marketing agencies must take higher margins, if they are to remain in business, to cover the risk they incur in the absence of accurate information on factors associated with fluctuations in prices. Since movement data are indicators of demand, a primary factor affecting price, it is imperative that such information be reliable.

Analysis of Wholesale Movement Data

Week-to-Week Change in Movement

The percentage change in the week-to-week movement of apples, as reflected by wholesale data, was of great magnitude in both the Chicago and Philadelphia markets. 10/ For receipts in Chicago, the average weekly change was 12 percent, fluctuating between a maximum decrease of 37 percent and a maximum increase of 47 percent. The weekly changes in receipts for Philadelphia averaged 20 percent, fluctuating between a decrease of 57 percent and an increase of 69 percent. The magnitude of fluctuations in "wholesale disappearance" of apples was comparable to the fluctuation in receipts. The range of the percentage change in week-to-week wholesale disappearance was from a decrease of 40 percent to an increase of 50 percent in Chicago and from minus 49 to plus 51 percent in Philadelphia. The average of the week-to-week percentage changes in wholesale apple disappearance was 19 percent in Chicago and 16 percent in Philadelphia (table 5).

Reliability of Wholesale Data

The wholesale movement data were derived from complete enumeration of all primary wholesalers handling apples moving into and within the markets covered, and hence are not subject to sampling errors. 11/ However, it is probable that certain nonsampling errors were made in collecting the data. For example, inventories may be overlooked or counted twice, especially in large warehouses in which several commodities are stored, or a great amount of "in and out" movement occurs. Invoices covering sales or receipts also can be mislaid and excluded from the computations. Unfortunately, there is generally no basis for estimating the extent or magnitude of such errors.

Estimates of standard errors were calculated for the week-to-week changes in wholesale movement of apples in Philadelphia from the disappearance data

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10/ Percentage change in movement from previous week based upon market news reports of rail and truck receipts issued by the Fruit and Vegetable Division, Agricultural Marketing Service, U. S. Department of Agriculture.

11/ See discussion of sampling errors, page 21.

Table 5.--Changes in weekly wholesale apple receipts and disappearances, Chicago, Ill., and Philadelphia, Pa., 27 weeks, October 19, 1956, through April 26, 1957 1/

(Percentage change from preceding week)

Weeks from October 19	Chicago		Philadelphia	
	Receipts	Disappearance	Receipts	Disappearance
	Percent	Percent	Percent	Percent
2	-1.4	1.8	19.9	32.3
3	-12.0	-17.0	-27.6	-20.3
4	-4.7	15.7	11.5	2.4
5	5.8	-16.6	-0.9	-6.7
6	3.4	4.6	39.8	28.9
7	11.0	12.0	-20.6	-5.9
8	-10.1	4.4	12.1	-13.7
9	6.4	4.9	8.1	41.4
10	-36.6	-33.4	-57.3	-49.3
11	47.1	-4.2	29.3	.0
12	-19.4	49.8	26.3	23.0
13	5.5	-27.7	6.2	20.4
14	41.2	17.1	25.2	10.7
15	-5.8	24.1	-16.2	-12.5
16	10.9	19.1	2.3	-2.6
17	-9.0	22.2	.0	-2.7
18	-11.8	-24.5	-22.9	-9.8
19	-5.6	20.3	68.9	51.2
20	15.2	7.2	-18.9	-12.0
21	7.6	-9.0	3.8	1.3
22	10.4	8.2	-3.6	-14.4
23	-13.7	8.2	-17.0	-3.3
24	-18.8	-35.6	18.2	6.1
25	-1.5	47.3	-11.6	5.5
26	-0.5	-40.0	-23.1	-33.9
27	-3.4	16.1	37.2	-5.4
Average	12.3	18.9	20.3	16.0
Range (maximum decrease to maximum increase)	-36.6 to 47.1	-40.0 to 49.8	-57.3 to 68.9	-49.3 to 51.2

1/ Formula for computing numbers in this table is:

$$100\left(\frac{\text{Sales current week}}{\text{Sales preceding week}}\right) - 100 = \text{percentage change}$$

obtained from primary receivers (chain organizations and independent wholesalers) over a 7-week period, November 12-December 28, 1956. Only 21 out of 26 wholesalers furnished complete information on movement in each of the 7 weeks. The 21 dealers constituted the sample from which the standard errors were calculated. These standard errors are biased in the sense that the sample was not randomly selected, and the records analyzed may be more accurate than those of the dealers who did not provide a complete report each week.

The week-to-week percentage change in wholesale movement, with 95 percent confidence limits, is shown in figure 1. The 95 percent confidence intervals (2 x standard error) for weekly estimates of changes in movement were not related to magnitude of the changes which occurred. The average week-to-week change in wholesale movement indicated by these data was 21.5 percent, with an average standard error of 4.9 percent.

Even though the errors calculated from these data are biased and may slightly understate the magnitude of the actual errors, they do provide an estimate of the accuracy of reports such as those used in this study covering the wholesale movement of apples in Chicago and Philadelphia.

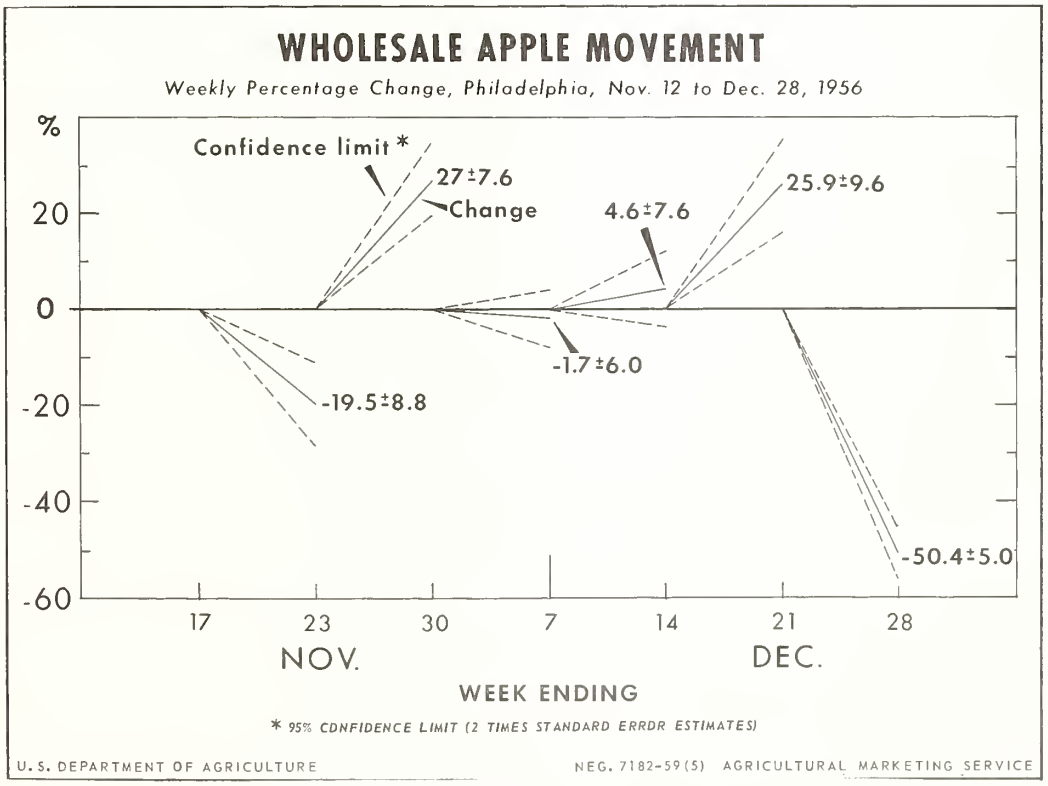

Figure 1

Relation of Receipts and Wholesale Disappearance

The rail and truck receipts and disappearance of apples from wholesale channels are shown in figure 2 for Chicago and figure 3 for Philadelphia for October 26, 1956, through April 26, 1957. 12/ As indicated in the previous section on week-to-week changes, fluctuations of great magnitude occurred in each of the cities for both arrivals and disappearances. The magnitude of the fluctuations in movement was quite similar in the two cities for both sets of data. However, the relationship of receipts and disappearances and the extent of inventory adjustment varied between the two cities.

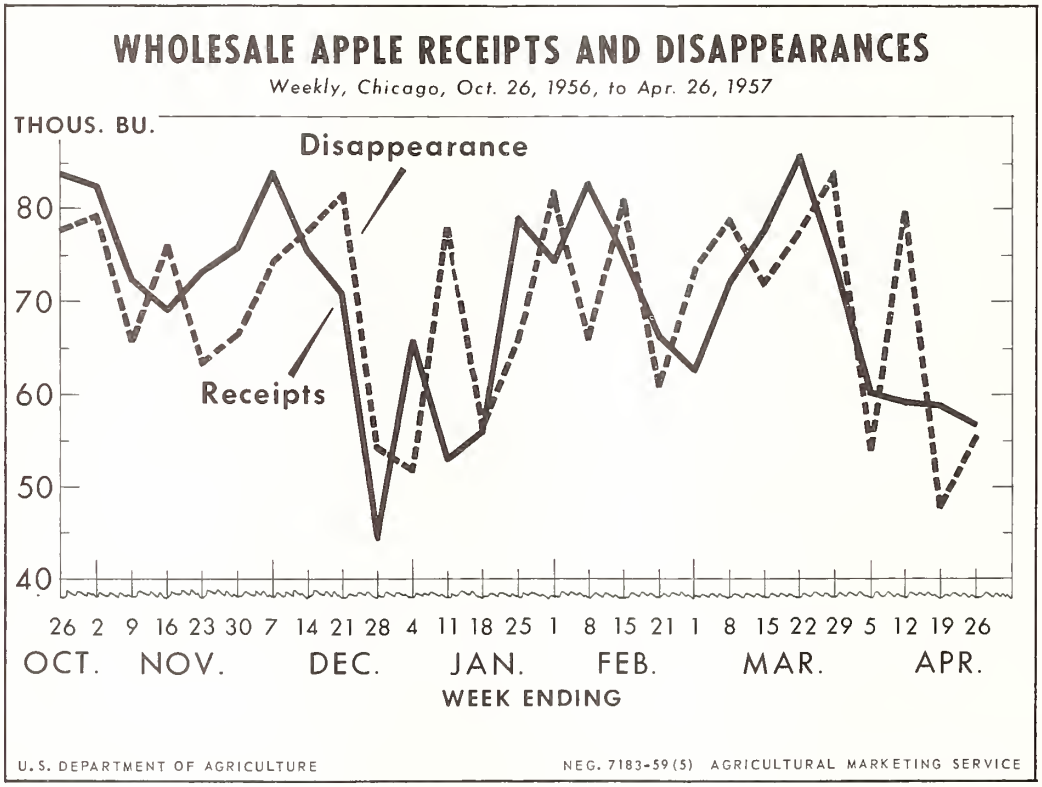
WHOLESALE APPLE RECEIPTS AND DISAPPEARANCES
Weekly, Chicago, Oct. 26, 1956, to Apr. 26, 1957
THOUS. BU.
Disappearance
Receipts
80
70
60
50
40
26 2 9 16 23 30 7 14 21 28 4 11 18 25 1 8 15 21 1 8 15 22 29 5 12 19 26
OCT. NOV. DEC. JAN. FEB. MAR. APR.
WEEK ENDING
U.S. DEPARTMENT OF AGRICULTURE
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Figure 2

In Philadelphia, weekly disappearances and receipts were closely associated. The correlation coefficient (r) of receipts and disappearances was 0.84. The regression coefficient (b) of receipts on disappearances was 0.81. The coefficient of determination (R^2) was 0.706; that is, 70.6 percent of the variations in disappearances were directly associated with variations in receipts. The standard error of the prediction equation ($Y = a + bX$) was 3.3 thousand bushels, where

12/ Source of data: Market News Report, Fruit and Vegetable Division, Agr. Mktg. Serv., U. S. Dept. Agr.

Y = predicted disappearances

b = regression coefficient of receipts (X) on disappearance (y)

X = weekly receipts (rail and truck receipts)

a = a constant calculated from the original data

(a = Y - bX; Y = average weekly disappearance, X= average weekly receipts)

The close relation of receipts and disappearances of apples in the Philadelphia market is probably due to the nearness to eastern producing areas, and the small amount of cold storage facilities available compared to Chicago. The nearness to growing areas allows dealers to obtain supplies of apples quickly and readily.

Expansions and contractions in inventories in Philadelphia were minor in relation to disappearances and arrivals, as revealed by the size of the standard error and coefficient of determination. Thus, rail and truck receipts are a good index of the movement of apples in the wholesale channel of trade in Philadelphia.

An inspection of data on receipts and disappearances for Chicago reveals that the relationship is not constant (figs. 2 and 4). Generally, changes in rail and truck receipts preceded corresponding changes in wholesale disappearances 1 to 2 weeks, causing rather pronounced contractions and expansions in inventories. Another probable cause of these contractions and expansions is the fact that Chicago is a major diversion apple market for primary eastern and southern markets and also a primary market for a number of nearby secondary markets, as well as a large consuming market. Also, the secondary wholesale markets usually have one or more alternative sources of supply which would affect the relationship of receipts and disappearances in Chicago.

The analysis showed the closest relationship was obtained when receipts were lagged 1 week (fig. 4). However, even with this lag, there was still considerable variation between the two sets of data as evidenced by a correlation coefficient (r) of only 0.56 and a coefficient of determination (R^2) of only 0.31. The regression coefficient (b) of receipts on disappearances 1 week later was 0.584. The standard error of the regression equation ($y = a + bX$) as previously described was 8,900 bushels. Since the confidence range would amount to approximately 18,000 bushels at the 67 percent level and 36,000 bushels at the 95 percent level, it is obvious that rail and truck receipts are not a good indicator of the disappearances of apples from wholesale channels in the Chicago market.

Trends in Wholesale Movement

As shown in figures 2 and 3, the weekly wholesale movement of apples (receipts and disappearances) oscillated over the period studied; that is, movement fluctuated above and below the general trend of movement. Peaks

or valleys occurred at intervals of 2 to 4 weeks. There was no definite sequence or cyclical pattern in the intervals between the peaks or valleys in the movement; thus, cyclical trends in the movement of apples would not provide a reliable indicator of future movement over a short time in wholesale channels.

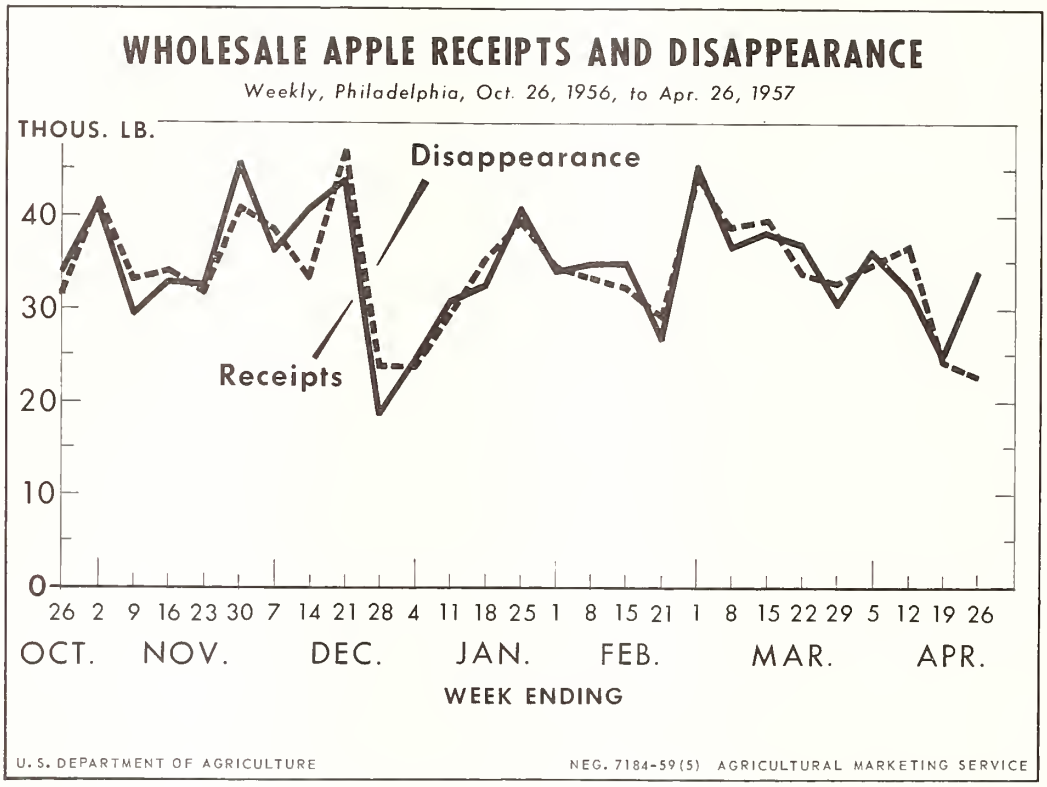
WHOLESALE APPLE RECEIPTS AND DISAPPEARANCE
Weekly, Philadelphia, Oct. 26, 1956, to Apr. 26, 1957
THOUS. LB.
Disappearance
Receipts
40
30
20
10
0
26 2 9 16 23 30 7 14 21 28 4 11 18 25 1 8 15 21 1 8 15 22 29 5 12 19 26
OCT. NOV. DEC. JAN. FEB. MAR. APR.
WEEK ENDING
U.S. DEPARTMENT OF AGRICULTURE
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Figure 3

Appraisal of Wholesale Movement Reports

For a market such as Philadelphia, rail and truck receipts would be a good index of the wholesale disappearance of apples in the market. For a market with characteristics similar to Chicago with its large storage facilities and its many secondary outlets, rail and truck receipts would not be a reliable indicator of the disappearance of apples from primary wholesale establishments.

In either market, the magnitude of the fluctuation in wholesale movement would raise serious questions as to the reliability of such data as indicators of the movement of apples into consumption. For example, during 3 consecutive weeks, February 21 through March 8, 1957, wholesale disappearances of apples in Philadelphia were 29,000, 44,000, and 39,000 bushels of apples. During a corresponding 3-week period, March 29 through April 12 in Chicago, the wholesale movement was 84,000, 54,000, and 78,000 bushels. 13/

13/ These weeks were selected to avoid possible influence of such days as Halloween, Thanksgiving, and Christmas.

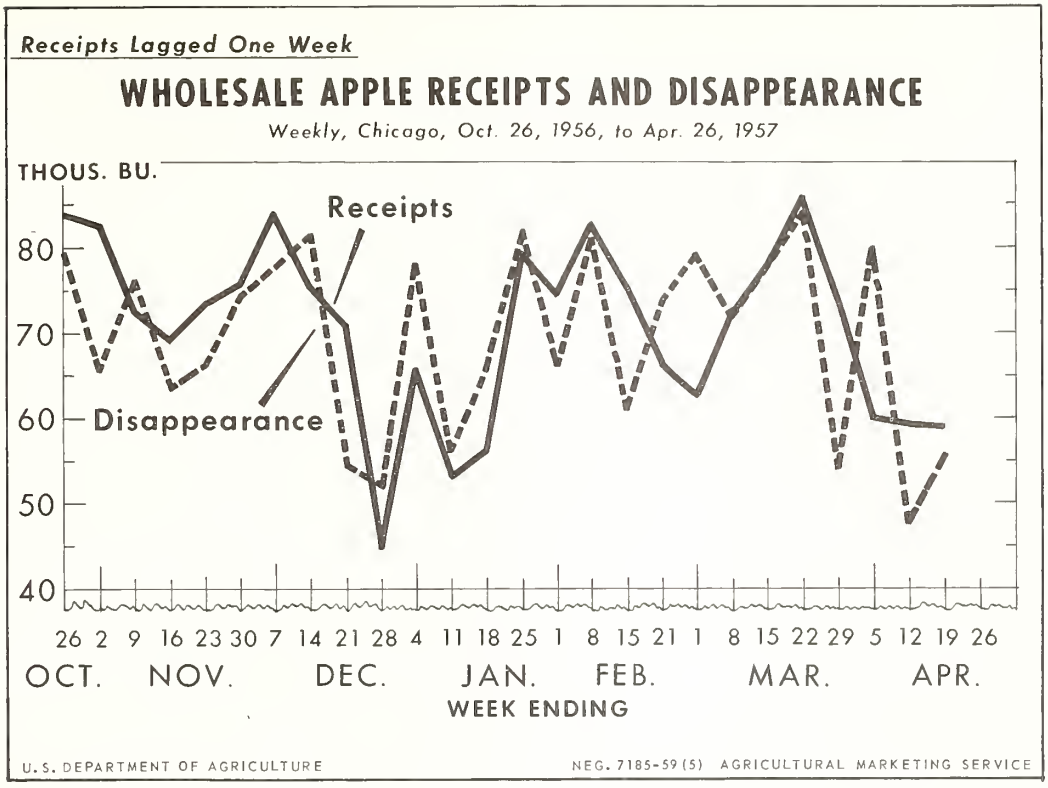
Receipts Lagged One Week
WHOLESALE APPLE RECEIPTS AND DISAPPEARANCE
Weekly, Chicago, Oct. 26, 1956, to Apr. 26, 1957
THOUS. BU.
Receipts
Disappearance
80
70
60
50
40
26 2 9 16 23 30 7 14 21 28 4 11 18 25 1 8 15 21 1 8 15 22 29 5 12 19 26
OCT. NOV. DEC. JAN. FEB. MAR. APR.
WEEK ENDING
U.S. DEPARTMENT OF AGRICULTURE
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Figure 4

It would appear logical that changes of such magnitude (approximately 40 percent) were more closely associated with changes in inventory holdings among jobbers, institutions, and chain warehouses than with actual changes in consumption of apples. For such changes to occur in consumption, either (1) all consumers would change consumption patterns 50 percent from week to week, (2) 50 percent of consumers were in or out of the market for apples from week to week, or (3) there was some combination of these two situations. However, as shown in the following section, weekly changes in estimated retail movement during this period did not exceed 12 percent.

Jobbers, institutions, and chain buyers may contract or expand their orders and inventories under a number of conditions. If there is danger of loss from quality deterioration of stocks on hand, these agencies are most likely to concentrate on moving this stock before buying new supplies. Chain-stores may buy heavily for weeks when apples are featured in newspaper advertisements and work off excess inventories during the following week or weeks. This would distort wholesale movement data if the chains are a dominant part of the retail market. Buyers for such organizations are also likely to take advantage of price fluctuations, since apples can be carried in common storage for short periods. Thus, the extreme fluctuations in wholesale movement data probably overemphasize changes in consumption.

Analysis of Retail Movement Data

Retail sales of apples through retail food stores were projected to universe totals each week based on data obtained from the sample of 100 retail food stores. 14/ These data indicated changes in movement from week to week ranging from 0 to 20 percent (increases or decreases). Changes ranging between 15 and 20 percent occurred during the weeks preceding and the weeks after Thanksgiving and Christmas and during the first and second weeks of January. Other weekly changes in movement, during the period studied, were between 0 and approximately 12 percent. 15/

Large stores accounted for approximately 75 percent of the estimated total retail sales of apples in the Philadelphia area. Thus, the magnitude of weekly changes in stores of this size exerted considerable influence on the total estimated movement of apples. However, the fluctuations in weekly sales in large stores and in small stores were closely associated as shown in figure 5.

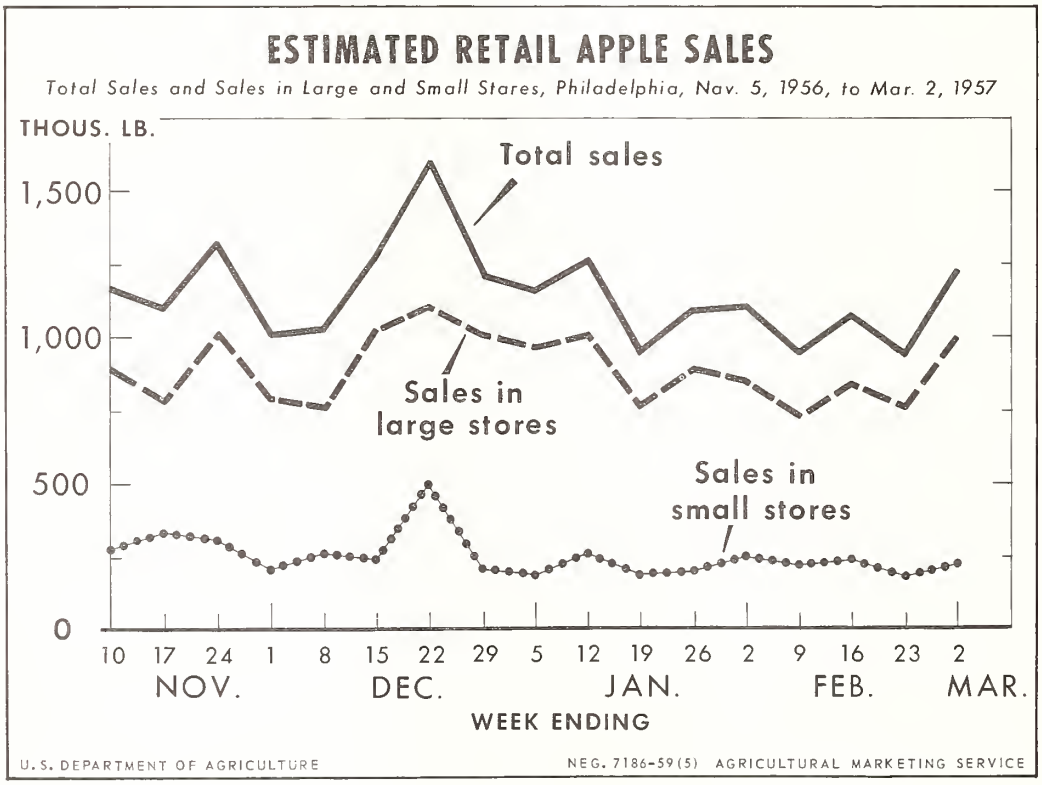
ESTIMATED RETAIL APPLE SALES
Total Sales and Sales in Large and Small Stores, Philadelphia, Nov. 5, 1956, to Mar. 2, 1957
THOUS. LB.
1,500
1,000
500
0
Total sales
Sales in large stores
Sales in small stores
10 17 24 1 8 15 22 29 5 12 19 26 2 9 16 23 2
NOV. DEC. JAN. FEB. MAR.
WEEK ENDING
U.S. DEPARTMENT OF AGRICULTURE
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Figure 5

14/ This projection technique is described in an unpublished article by E. E. Houseman and B. Lipstein.

15/ Retail movement data were collected over 17 weeks beginning November 5, 1956, and ending March 2, 1957.

Reliability of Retail Estimates and Changes

Sampling errors of estimated apple sales.--Sampling errors are errors attributable to the fact that measurements are based on a sample of stores rather than on complete enumeration of all stores. For example, if repeated random samples of the same number of elements were drawn from the same population or universe the value of the sample total or average would probably vary from sample to sample. Estimates of the population total or average based on the samples would also vary in a similar manner, while the true total or average would be within the range of the estimates made from the samples. The standard error is a statistical measure of the sampling error as described above and the nonconstant part of nonsampling errors made in recording and computations, and is computed from the sample data. Thus, it is possible to state the range, in terms of the standard error, in which the true total or average of a population will fall in relation to the sample total or average. That is, the probability is 0.67 (2 times in 3) that the true total or average would fall within a range of plus or minus 1 standard error of the sample estimate and 0.95 (95 times in 100) that the true total would be within a range of plus or minus 2 standard errors of the sample estimate.

For purposes of demonstrating this sampling variability, the total sample of 100 stores was divided into 2 subsamples of 50 stores each, referred to as sample A and sample B. Separate estimates of total sales were computed using the data from the 2 subsamples for the entire period of the study. The estimated week-to-week percentage changes in total apple sales, based on the estimates of total weekly sales computed for samples A and B, are compared in figure 6. The divergence of the estimated weekly changes as illustrated for the 2 subsamples is due primarily to the sampling errors involved.

The magnitude of such errors depends upon how well the sample elements represent the population or universe from which they are drawn. The representativeness of a sample, in turn, depends on the variation found in the population, the size of the sample (number of elements drawn), and the manner in which the sample is drawn. In randomly drawn samples, each element in the population has an equal probability of being drawn. Therefore, the probability of obtaining large sampling errors, for samples of a fixed size, is much greater if the sample is drawn from a population in which the value of the elements varies over a wide range than from one in which the elements vary over a narrow range. This is because it is possible to draw all the elements of individual samples from any part of the range of the population--even the extremes of the range. Increasing the size of the sample reduces the probability of drawing all of the elements in a sample from the extreme ranges of the total population and thereby reduces the sampling error; thus, the magnitude of sampling errors approaches zero as the size of the sample approaches the size of the total population. If sufficient knowledge of the characteristics of a population is available and the elements can be divided or stratified into homogeneous (similar) groups, the magnitude of sampling errors for samples of a given size can be reduced by drawing the elements of the sample at random from each stratum (group). That is, greater representativeness is insured in drawing the sample.

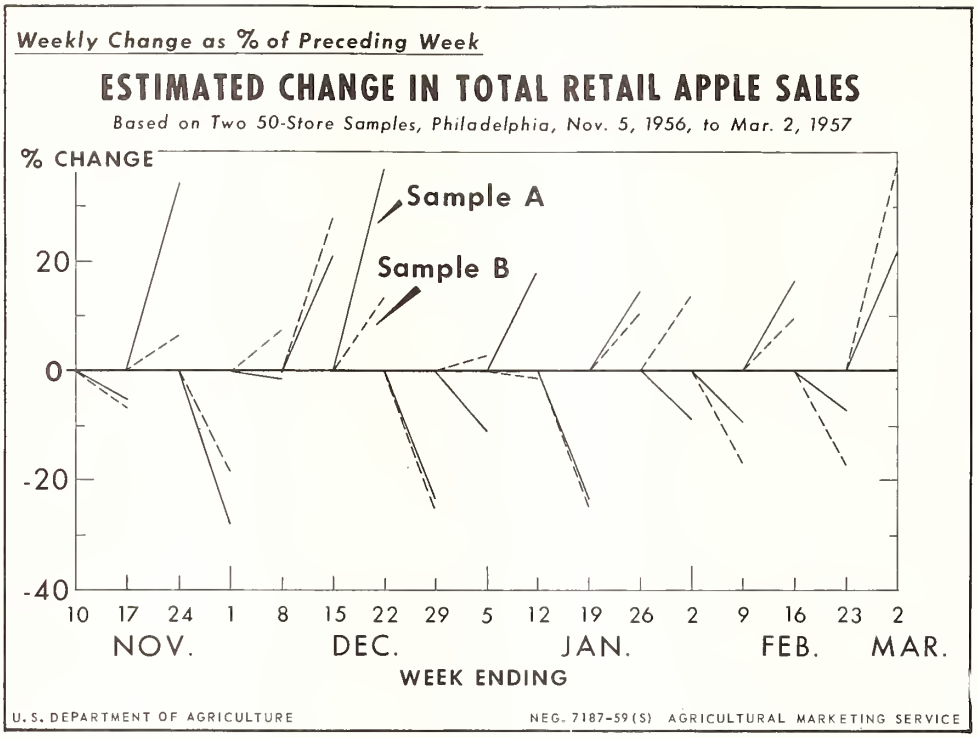
Weekly Change as % of Preceding Week
ESTIMATED CHANGE IN TOTAL RETAIL APPLE SALES
Based on Two 50-Store Samples, Philadelphia, Nov. 5, 1956, to Mar. 2, 1957
% CHANGE
Sample A
Sample B
20
0
-20
-40
10 17 24 1 8 15 22 29 5 12 19 26 2 9 16 23 2
NOV. DEC. JAN. FEB. MAR.
WEEK ENDING
U.S. DEPARTMENT OF AGRICULTURE
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Figure 6

Accuracy of estimated total weekly apple sales.--Estimates of total apple sales in Philadelphia based on the total sample (100 stores) and the 2 subsamples are compared in figure 7. Estimates of apple sales based on the smaller samples generally followed the same trends as the estimate based on the total sample, but the magnitude of the week-to-week fluctuations in estimated sales was generally greater in the smaller samples.

For some of the weeks, opposite changes in movement were indicated by the data from the two subsamples (fig. 6). Estimates based on the total sample (100 stores) fall between the estimates based on the two subsamples as the opposite variations in the subsamples tended to counteract each other.

The chief limitation in estimates based on smaller samples is accuracy in reflecting week-to-week changes in movement, while the advantage of the smaller samples is lower cost of collecting data.

Standard errors of estimated total retail apple sales (based on the 100-store sample) were calculated for 4 different weeks. The magnitude of the sampling errors ranged from 3.8 to 7.7 percent of estimated total sales, with an average of 6.3 percent. 16/ The standard errors of estimated total

16/ Standard errors of estimate were calculated and converted to coefficients of variation expressed in percent:

$$\text{Coefficient of variation} = \frac{\text{Standard error of estimated sales}}{\text{Estimated sales}}$$

retail apple sales were computed for other sample sizes as shown in table 6. It can be noted that increasing the sample size reduces the standard error of estimated sales, but not proportionately. Similarly, when the sample size is reduced, the magnitude of the standard error is increased. Reducing the size of the sample by one-half (50 percent) inoreased the magnitude of the standard error of estimate 140 percent, while doubling the sample size reduced the standard error 30 percent.

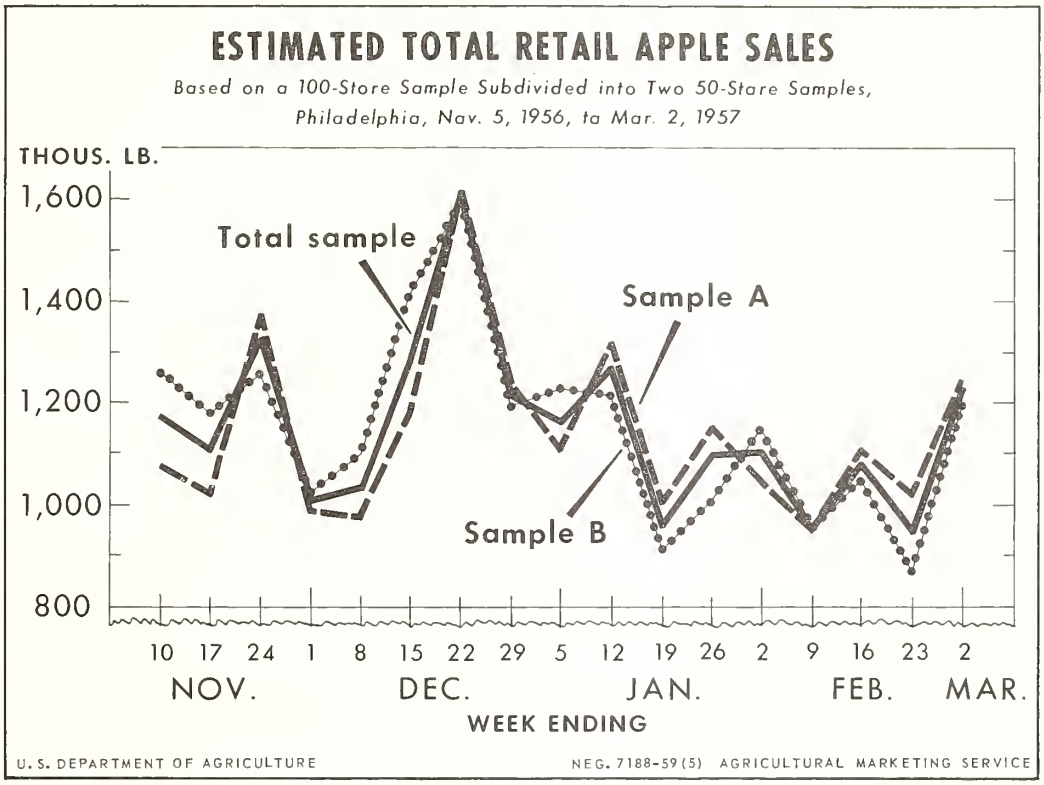
ESTIMATED TOTAL RETAIL APPLE SALES
Based on a 100-Store Sample Subdivided into Two 50-Store Samples, Philadelphia, Nov. 5, 1956, to Mar. 2, 1957
THOUS. LB.
1,600
1,400
1,200
1,000
800
Total sample
Sample A
Sample B
10 17 24 1 8 15 22 29 5 12 19 26 2 9 16 23 2
NOV. DEC. JAN. FEB. MAR.
WEEK ENDING
U.S. DEPARTMENT OF AGRICULTURE
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Figure 7

Sampling errors of estimated weekly changes in apple sales.--The estimated percentage changes in weekly apple sales are calculated from the estimates of total sales each week and are subject to sampling errors contained in the estimate of sales for each of the weeks used in calculating the changes. Thus, the magnitude of the standard error of estimated changes in sales may be normally greater than the standard error of estimated total sales for specific weeks, since two sampling errors are involved in estimates of the two totals used in the computations.

Standard errors of estimated changes in total weekly apple sales based on data from the 100-store sample were calculated for 7 selected pairs of weeks. The range of the standard errors of weekly changes in estimated sales was from 6.1 to 9.4 percent, averaging 7.4 percent.

Table 6.--Estimated sampling errors for various sizes of samples when estimated total apple sales are 1,200,000 pounds, Philadelphia, Pa.

Number of stores in sample	Standard error	Coefficient of variation 1/
	Pounds	Percent
50	106,800	8.9
100	75,600	6.3
150	61,200	5.1
200	54,000	4.5

1/ Standard error expressed as percentage of estimate.

Since there are theoretically two chances out of three that the actual changes in movement (from sample data) will fall within the interval of plus or minus one standard error of the estimated change in movement, it would be necessary to obtain a change greater than 7.4 percent before one could say with a reasonable degree of confidence that an actual change has occurred. Therefore, for reporting changes in movement of less than approximately 7.5 percent, the usefulness of the data produced with this method and sample size would be limited to establishing trends in movement. However, the weekly changes in the retail movement of apples during the period of the survey did average about 15 percent. Further inspection of the data show that of the 16 week-to-week changes in movement which were measured, 4 were less than 6 percent, 1 about 8 percent, and 11 between 12 and 29 percent (table 7). 17/ The major changes (over 20 percent) seemed to be associated with Halloween, Thanksgiving, Christmas, and the weeks following Christmas and New Year's Day. The major changes during the weeks after Christmas and New Year's Day were probably influenced by purchases made by consumers for Christmas, and the activities of retailers in liquidating excess inventories.

If changes in retail movement of less than 10 percent are not important to shippers, wholesale handlers, and others, then information obtained through the sampling procedure used in this phase of the study (observation in large stores and audits of records in small stores) would be sufficient for the needs of the trade. On the other hand, if it is important to detect changes of approximately 2 or 3 percent, then it would be necessary to increase the size of the sample or devise a more precise sampling procedure.

Sampling errors of estimated week-to-week changes in total apple sales were computed for samples of 50, 100, 150, and 200 stores as follows:

17/ 16 week-to-week changes over 17-week period.

Number of stores in sample	Standard error (percent)
50	10.9
100	7.4
150	6.3
200	5.4

Comparison of Methods for Reporting Retail Apple Movement

Sales data obtained from audits of store records in 40 large stores were used (1) to compare the reliability of estimated movement based upon audit data and observation data, (2) to determine the relationship of the volume of apples received by the stores, the volume of apples sold, and the time lag between receipts and sales, and (3) to compare the sampling variability of estimated changes in weekly apple sales in large and small stores based on audit data.

Audit and observation methods in large stores.--An inspection of the data revealed that estimates of retail apple sales in the large stores based on the observation method closely approximated the estimates based on audits when adjustments were made for changes in the number of customers observed in stores each week (fig. 8). Further analysis of the data obtained by the two methods of collection showed that the standard errors of estimated weekly changes in apple sales were slightly larger for estimates based on observation data than the estimates based on audits of store records. 18/ However, the difference in the magnitude of these errors was not sufficient to be significant being only 0.1 percent (table 8). Thus, the reliability of estimates of changes in total apple sales based on sales data obtained by the two methods is approximately equal.

Sampling errors in audit sales data for large and small stores.--Inspection of sales data from the stores in the sample indicated that the week-to-week percentage change in apple sales was considerably greater in small stores than in large stores.

For samples of comparable size, the magnitude of the sampling errors of week-to-week changes in apple sales was approximately twice as great for the small stores as the large stores (table 8). In fact, a sample of 50 large stores is a more accurate representation of large stores for reporting weekly changes in movement than 200 small stores is of the universe of all small stores in Philadelphia, as evidenced by the size of the standard error.

The estimates of standard errors in table 8 can be used to calculate the number of large stores or small stores required in a sample having the degree of precision desired for estimates of week-to-week changes in apple sales. For example, if it were desired to obtain estimates of weekly changes in apple

18/ Estimated week-to-week changes in total apple sales in large stores (stores having weekly sales volume of $6,000 or more) in the Philadelphia metropolitan market.

sales in both large and small stores with a standard error of 5 percent, the sample size (n) would be 67 for large stores and 375 for small stores. 19/

Sizes of samples of small and large stores with stated degrees of accuracy (standard errors of 1 to 6 percent) for estimating weekly changes in retail apple sales are given in table 9.

Collecting data from the number of small stores required in a sample to detect changes in weekly sales of 6 percent or less (table 9) would be expensive. For instance, collecting sales data through audits from the 583 small stores needed to attain a standard error of 4 percent in the volume handled in these stores would require 6 or 8 enumerators working full time or 12 to 16 enumerators working the first 3 days of each week. The manpower requirement for the same degree of accuracy using the audit method with large stores would be about three full-time employees for each market covered--two store enumerators and one clerk to tabulate the information. This assumes that the enumerators would collect sales data for the previous week during the first, second, or third day of each week; and data on prices, varieties of apples on display, and other supplemental information during the latter part of each week. A conservative estimate of the total cost of reporting week-to-week changes in retail movement of apples in large stores (including travel, supervisory personnel, office rental, paper, mailing, office supplies, etc.) by the audit method would be about $20,000 per market per year. If the sample size were increased to that required to reduce the standard error of estimate to 3 percent, the estimated cost would be about $35,000.

19/ Formula for calculating sample size when estimate of variance of population is available for a specified sample is:

$$\frac{\text{Standard error}^2 \times \text{size of sample from which error is calculated}}{n\,(\text{size of sample necessary for desired standard error})} = \text{desired standard error}$$

Example: Small stores:

$$\sqrt{\frac{(0.137)^2 \times 50}{n}} = 0.05$$

$$\frac{(0.137)^2 \times 50}{n} = 0.0025$$

$$0.0025n = 0.938450$$

$$n = 375$$

Large stores:

$$\sqrt{\frac{(0.058)^2 \times 50}{n}} = 0.05$$

$$\frac{(0.058)^2 \times 50}{n} = 0.0025$$

$$0.0025n = 0.168200$$

$$n = 67$$

Table 7.--Changes in estimated weekly retail apple sales based on 2 subsamples of 50 stores each and total sample of 100 stores, Philadelphia, Pa., 17 weeks, November 1956 through March 1957 1/

Weeks	(Percentage change from preceding week) Sample A (50 stores)	Sample B (50 stores)	Total sample (100 stores)
	Percent	Percent	Percent
2	-5.1	-6.4	-5.5
3	34.3	6.2	19.3
4	-27.8	-18.2	-23.7
5	-1.6	7.2	2.3
6	21.1	28.1	23.5
7	36.8	13.2	25.7
8	-23.3	-25.1	-24.2
9	-10.5	2.9	-4.2
10	18.3	-1.3	8.5
11	-23.4	-24.8	-24.3
12	14.6	10.4	14.5
13	-8.9	13.8	.5
14	-9.3	-16.8	-13.6
15	16.2	9.9	13.3
16	-7.3	-17.0	12.3
17	21.3	37.3	29.2
Average 2/	16.5	14.0	15.3
Range (maximum decrease to maximum increase)	-27.8 to 36.8	-25.1 to 37.3	-24.3 to 29.2

1/ Formula for computing percentages in this table is:

$$100\frac{(\text{Sales current week})}{(\text{Sales preceding week})} - 100 = \text{percentage change}$$

2/ Average of all changes regardless of whether changes were increases or decreases.

Obtaining and reporting changes in apple sales by the observation method would be more expensive than by the audit method. More enumerators would be required for specified sample sizes, since an enumerator would be required to remain in each store for specified periods of time each day. Also the stores would have to be visited in a definite order each week which would require added travel expense as well as time. It is estimated that a minimum of 4 enumerators and possibly 2 clerical workers to tabulate the data and prepare weekly reports, would be required to cover a sample of approximately 100 stores.

Thus, the cost would amount to approximately $30,000 to $35,000 per market for estimating percentage changes in weekly movement with a standard error of 4 percent. Reports covering changes in movement could be released to users 3 or 4 days earlier if the observation method were used; however, this advantage does not appear sufficient to offset the greater cost. Therefore, the audit method is recommended over the observation method for reporting weekly changes in retail movement of apples.

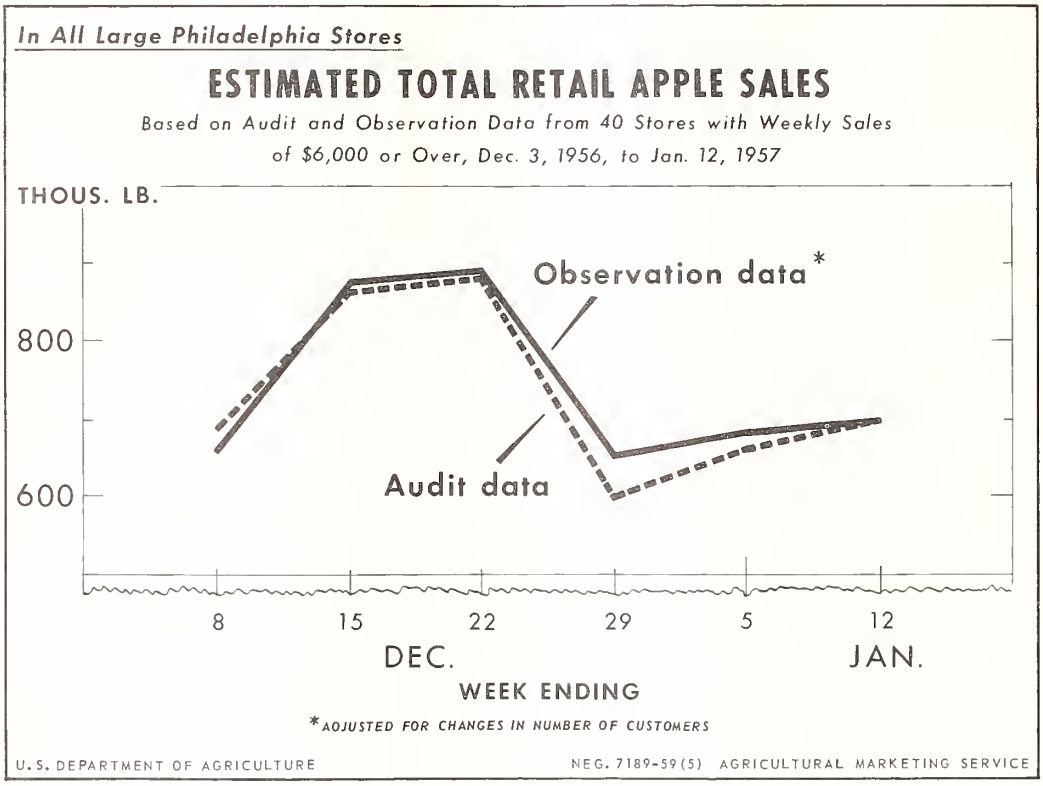

Figure 8

Store receipts as an index of retail sales.--Analysis of the data obtained in this study revealed a third and equally reliable but much less expensive method of measuring retail movement: that is, using store receipts as an index of retail sales of apples in large stores.

Supplies of apples must be obtained frequently from chain and jobber warehouses, because apples are bulky, semiperishable, and require refrigeration. Large retail stores normally carry small inventories in relation to weekly sales, and changes in weekly receipts appear to adequately indicate changes in the volume moving into consumption.

As shown in figure 9, the total volume of apples received by the 40 large stores and the total volume of apples sold are closely related. This is further borne out by the value of the correlation coefficients of weekly receipts on weekly sales and the small variation in the value of the coefficient. These

Table 8.--Standard errors of estimated weekly changes in apple sales for small and large stores, by size of sample and method of collecting data, Philadelphia, Pa., 1956-57 1/

Number of stores in sample	Small stores (audit only)	Large stores	
		Audit	Observation
	Percent	Percent	Percent
50	13.7	5.8	5.9
100	9.7	4.1	4.2
150	7.9	3.3	3.4
200	6.8	2.9	3.0

1/ Data are rounded to nearest one-tenth of 1 percent.

Table 9.--Estimated number of small or large stores required in sample for estimating weekly percentage changes in retail apple sales with errors of 1 to 6 percent, Philadelphia, Pa., 1956-57

Error of estimate (plus or minus)	Number of stores required in sample	
	Small stores 1/	Large stores 2/
1 percent or less	3/ 3,430	3/ 672
2 percent	2,333	420
3 percent	1,037	186
4 percent	583	105
5 percent	375	67
6 percent	259	47

1/ Small-store data collected by audits of store records; no correction made for finite population.

2/ Same number of large stores required for audit and observation methods of collecting data; no correction made for finite population.

3/ All small stores and large stores selling produce in Philadelphia metropolitan area at time of study; no correction made for finite population.

coefficients were calculated to determine the degree of relationship between the two sets of data using individual store records. The value of each coefficient calculated was 0.98, when rounded to 2 places, the extreme range being between 0.9750 and 0.9849. When the time periods were extended, the relationship between apples received and apples sold became more pronounced. The correlation coefficient of apple receipts and sales over a period of 1 month was 0.997.

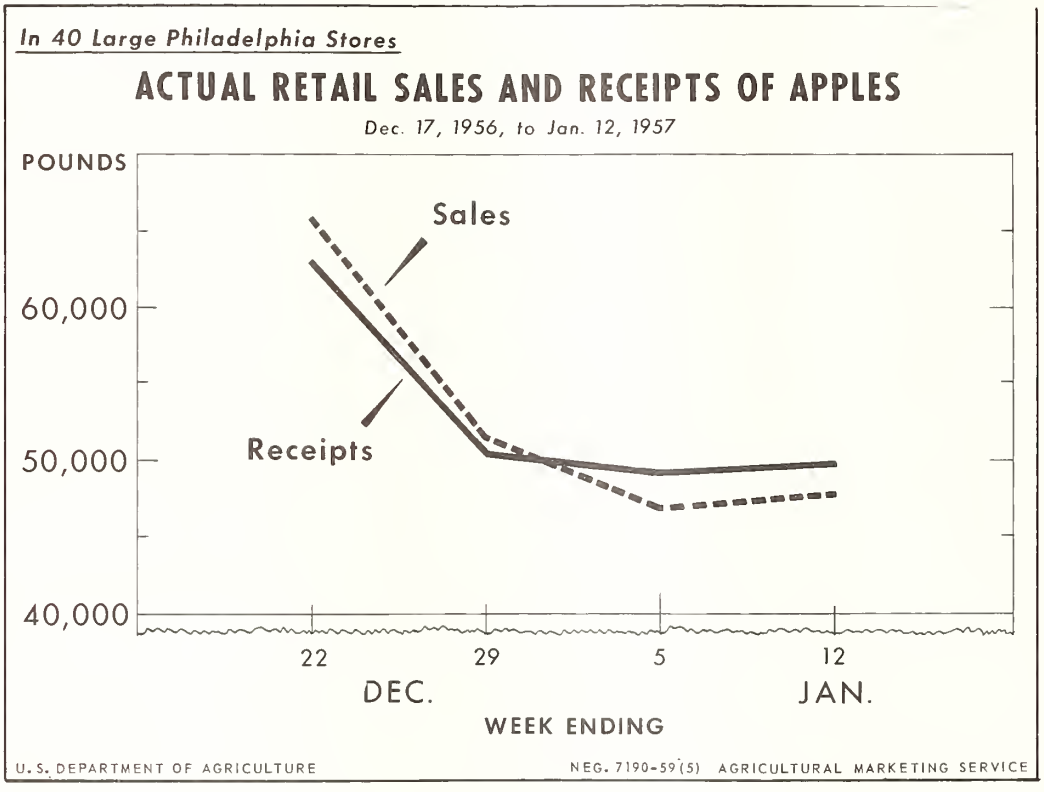

Figure 9

These coefficients indicate that most of the larger retail store operators in Philadelphia maintained an almost perfect balance between receipts and sales each week. 20/ This nearly perfect relationship of receipts and sales shows that retail receipts could be used to indicate changes in the retail movement of apples into consumption. Also, since retail stores normally receive their weekly supplies of apples by Friday of each week, receipt data could be collected and a report released by Tuesday of the following week. On the other hand, reports based on sales data collected by the audit method could not be released before Friday or Saturday of the following week.

Movement of apples into consumption could be reported by this method at relatively small cost. A record of weekly shipments to chainstore outlets, both corporate and voluntary, could be obtained by single calls to chain warehouses or headquarters.

20/ A correlation coefficient of 1.0 would indicate a perfect relationship.

It was found in Philadelphia that chain organizations were much more willing to release information of shipments to all stores than to maintain records of sales for individual stores. Thus, complete coverage of all stores serviced in an area by corporate and voluntary chain organizations could be obtained with a limited number of visits, or possibly by telephone. 21/ This would permit the enumerator to devote most of his time to obtaining supplemental information on prices, condition of fruit displayed, and merchandising practices employed by the stores.

If data were obtained from chain headquarters (corporate and voluntary) on deliveries to member stores, rather than from individual stores, greater precision would possibly be obtained for estimates of changes in movement, because of the larger number of stores that would be covered. Because of the correlation of apple receipts and sales in the large stores and more complete coverage of large stores (larger sample), estimates of changes in movement with standard errors of around 2 percent might reasonably be expected for apple sales in large stores when this method is used, at a much lower cost than when the audit method is used.

Personnel requirements and total costs of obtaining data on store receipts for reporting changes in movement would be considerably less than those of collecting sales data by audit or observation. Since deliveries to chainstore outlets (voluntary and corporate) could be obtained directly from the chain headquarters or warehouse, only a few large stores not affiliated with a chain would have to be visited individually to round out the sample. Estimated personnel requirements would be one man to collect data on receipts from individual stores and chain headquarters and personnally visit a sample of stores to obtain supplemental data on varieties, quality, condition, and prices. One clerk-stenographer would also be required for tabulation of the data and preparation of reports. Thus, the cost for reporting the movement of apples by this method during the heaviest part of the marketing season (October through March) would amount to about $6,000 to $7,500 for a city comparable in size to Philadelphia. The cost for clerical personnel could possibly be reduced if the added work were carried on in conjunction with other reporting work performed by the agency.

Estimated Retail Apple Sales Compared With Wholesale Disappearance of Apples

The general trends in estimated retail sales and wholesale disappearances of apples followed the same pattern from November 1956 through February 1957 in Philadelphia, but week-to-week fluctuations were not consistently correlated. The major fluctuations in wholesale disappearances were generally about 1 or 2 weeks later than the corresponding changes in retail movement, except during the weeks influenced by the Christmas holidays (fig. 10). Beginning in

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21/ Information collected in this way would normally cover a broader area than the metropolitan market, as chain warehouses usually service retail outlets in nearby cities and towns.

January, the wholesale movement was at a somewhat higher level than retail movement compared to earlier months, possibly because of changes in sources of supply for secondary markets surrounding Philadelphia. Conceivably, these markets would be serviced by primary wholesalers in the Philadelphia market when supplies of locally produced apples were exhausted.

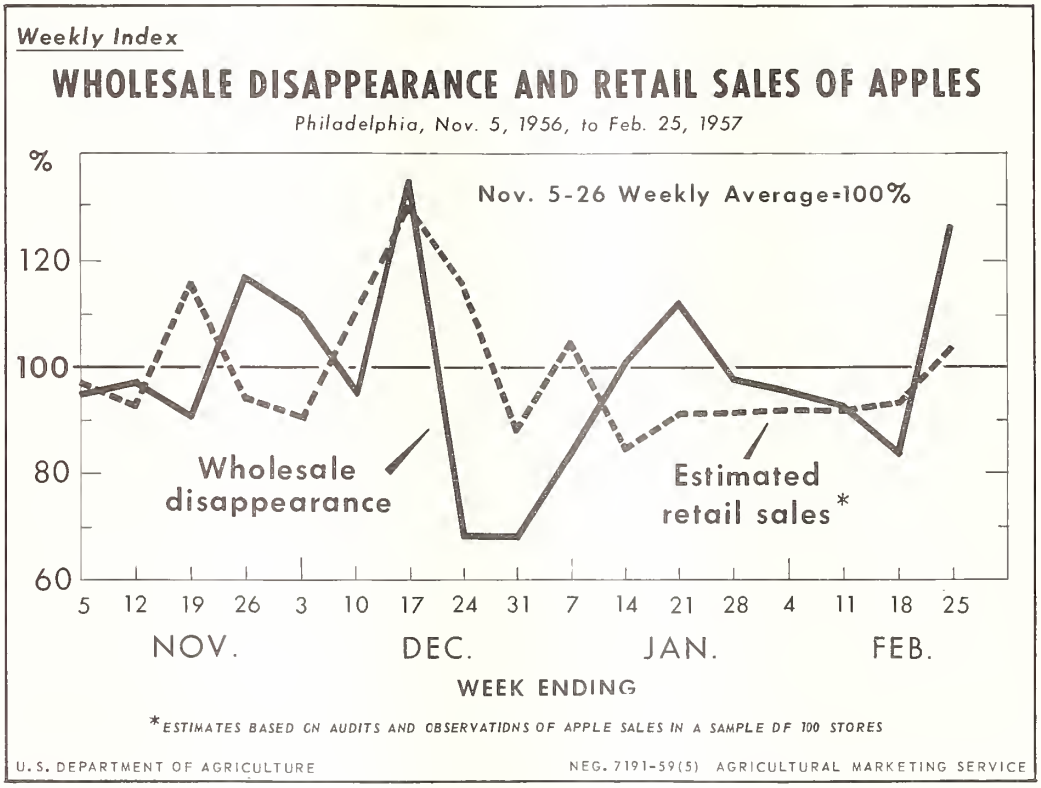
Weekly Index
WHOLESALE DISAPPEARANCE AND RETAIL SALES OF APPLES
Philadelphia, Nov. 5, 1956, to Feb. 25, 1957
%
Nov. 5-26 Weekly Average=100%
120
100
80
60
Wholesale disappearance
Estimated retail sales*
5 12 19 26 3 10 17 24 31 7 14 21 28 4 11 18 25
NOV. DEC. JAN. FEB.
WEEK ENDING
*ESTIMATES BASED ON AUDITS AND OBSERVATIONS OF APPLE SALES IN A SAMPLE OF 100 STORES
U.S. DEPARTMENT OF AGRICULTURE
NEG. 7191-59(5) AGRICULTURAL MARKETING SERVICE

Figure 10

The greatest weakness in the wholesale movement reports as an indicator of consumption rate is that changes in wholesale movement may be caused by factors other than movement from retail stores. Changes in wholesale movement without changes in consumers' buying patterns may occur as a result of inventory adjustments in the primary market and the secondary markets it serves, or the activities of speculators in the market (fig. 11).

Wholesale disappearance data do provide an indication of whether stocks received in markets (rail and truck receipts) are moving through the channels of trade or backing up in dealers' warehouses. The lack of such knowledge was frequently cited by apple handlers as a weakness in present market information (see next section).

The cost of collecting data for reporting wholesale movement is considerably lower than the cost of collecting retail movement data by the least expensive method found in this study. It is estimated that this work

(wholesale data) would require one-half man-year per market covered or approximately $3,000 per year if handled through an existing reporting agency. Nevertheless, the greater value of the retail report together with its supplemental information concerning merchandising practices, varieties, and prices, if obtained in the least expensive way (based on store receipts), would probably more than offset the added cost of reporting retail movement.

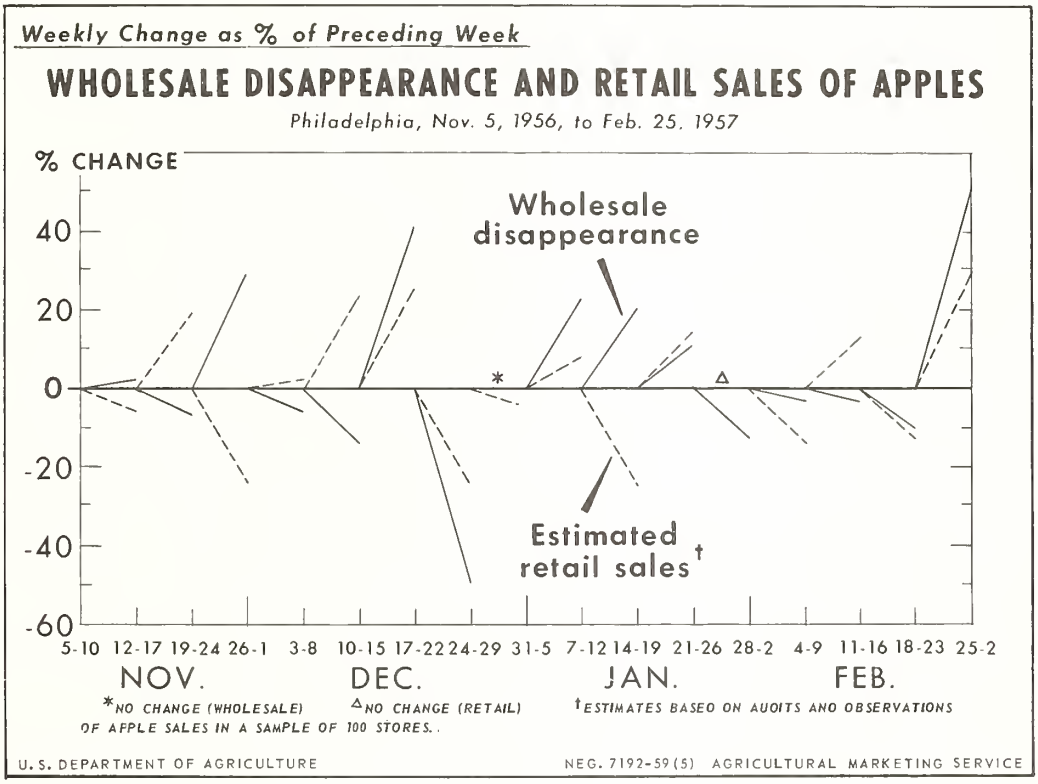

Figure 11

HOW APPLE SHIPPERS AND BUYERS MAKE MARKET DECISIONS

Shippers of apples in major growing areas and wholesale handlers of apples in Philadelphia were interviewed to determine factors they considered in making marketing decisions, and the sources of market information they used to evaluate these factors. The purpose of obtaining this additional information was to aid in appraising the relative value of the methods studied for obtaining data for movement reports, and the value of movement information to the trade.

Characteristics of Apple Shippers in Three Regions and Wholesale Apple Handlers in Philadelphia

The operations of most shippers and buyers interviewed represented various combinations of the textbook definitions of shippers and buying agencies.

Exceptions were the very small and very large grower-shippers, chain buyers, and terminal market brokers.

Most of the medium and large grower-shippers also act as selling agents for other growers. The shipping-point broker or sales agent generally makes all marketing decisions for the growers he represents. In this sense, he acts as a commission agent except that he charges a fixed brokerage fee for his services.

The shipping-point broker may also act as a buyer-shipper if prices are stable or if future price prospects appear favorable. If prices appear unstable, a buyer-shipper may curtail buying for his own account and act as a sales agent. In a similar manner, some terminal market commission merchants and brokers occasionally purchase apples for their own accounts to (1) speculate when prices are favorable, (2) hasten settlements to shippers by buying small residual lots of consigned fruit, or (3) maintain supplies of a particular variety or grade. 22/

All large shippers and buyers were found to be thorough in their analyses of the market for apples. These agencies make frequent reference to charts of seasonal shipping-point and terminal-market prices covering several years. They also maintain charts on seasonal movement of apples for a number of preceding years as indicated by changes in cold storage holdings between specific dates, volume shipped from specific areas, and volume received in specified markets. Historical series are maintained in some areas on annual carryover and movement of stocks of processed apples and on prices paid by processors. Up-to-date estimates are maintained on national production in important commercial areas, and on varieties, size, and condition of the apples. 23/ Knowledge of current purchasing power of consumers is maintained through reference to business publications and daily newspapers. With this information, dealers can estimate with fair accuracy the wholesale demand for apples, that is, the price and wholesale movement which must be maintained throughout the season to move the supplies on hand.

In establishing an opening price for a season, large-volume shippers and brokers with the problem of storing and moving large supplies generally favored a starting price which would insure a "healthy movement" throughout the season. 24/ Smaller shippers, on the other hand, endeavored to market as much

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22/ 43 percent of the commission merchants and 36 percent of the brokers interviewed in Philadelphia were found to purchase apples for their own accounts at times.

23/ Size of fruit is important in marketing, since there is a limited demand for specific sizes; also, the size as well as the condition of the fruit when harvested affects the storage life.

24/ "Healthy movement" is a term used by the trade meaning a rate of movement sufficiently high to avoid excessive inventories and poor returns in the latter part of the marketing season. Most of the large shippers interviewed said that when prices were too high at the beginning of the marketing season movement was unusually low, and prices had to be lowered to "fire sale" level before the rate of movement increased enough to insure consumption of the crop over the normal marketing season.

fruit as possible during the early part of the marketing season and naturally favored a high opening price.

Terminal market brokers were generally more interested in handling or moving a large volume of fruit than in bargaining for a high price for a specific lot of fruit. This is as expected, since they are compensated in terms of volume handled and clients determine when and for what price a product will be sold. However, brokers are expected to advise clients on price and those whose advice is valued generally increase in size of business. Commission agents seemed to be primarily interested in obtaining as high a price as possible on each lot sold, since this not only results in increased commissions per lot but tends to cause their services to be in demand and their volume to increase. The attitude of the shipping-point broker or sales agent toward the price of fruit appeared to be a combination of the attitudes of both the terminal market broker and the commission agent; that is, he has an equal interest in handling a large volume and receiving a high return on each shipment.

Methods of Sale and Market Outlets

Proportions of shippers who use the various methods of sale differ among regions as shown in table 10. However, in all three regions in the survey shippers prefer to sell their apples at a firm price directly to representatives of chain organizations, buyer-shippers, or processors, or to purchasers in distant markets through terminal-market brokers. Western and large eastern shippers, particularly, depend on terminal-market brokers for negotiation of sales, although some of these shippers arrange sales directly with buyers. In either event, most shippers prefer to sell apples at a fixed price rather than to incur the price uncertainty that results when apples are either consigned or shipped unassigned and unsold to a terminal market.

Table 10.--Percentage of apple shippers in 3 regions using specified methods of sales. May-June, 1958 1/

Method of sales	Region		
	Appalachian	Pacific Northwest	New York-New England
	Percent	Percent	Percent
F. o. b. shipping point	75	90	63
Consigned to an agent	75	38	89
Delivered to buyer	17	3	53
Auction at terminal market	0	45	0

1/ Shippers may use several methods of sale; hence, percentages will add to more than 100.

Many shippers who consigned apples to terminal-market commission agents explained that they chose this outlet to dispose of "distressed fruit." 25/ Eastern shippers usually consign "distressed fruit" to a commission house in a convenient terminal market. A western shipper, on the other hand, is likely to start a car of fruit without having found a prospective buyer or without assigning the car to a particular market. This shipper will deal with brokers in various markets in hope of finding an f.o.b. sale (shipping point). If an f.o.b. sale cannot be made, the car will be routed to an auction market or consigned in a specific market.

A comparison of the major sales outlets used by shippers in the three regions in the sample is shown in table 11.

Table 11.--Percentage of apple shippers in 3 regions using specified market outlets, May-June 1958 1/

Market outlet	Region			Weighted average, all regions
	Appalachian	Pacific Northwest	New York-New England	
	Percent	Percent	Percent	Percent
Chain organizations	79	90	95	88
Terminal-market wholesalers	83	78	89	82
Terminal-market brokers	71	85	53	73
Commission merchants	75	8	89	58
Processors	54	8	84	40
Bulk sale to truckers	50	3	21	20
Shipping-point brokers	20	5	11	11

1/ Shippers use more than 1 type of outlet; hence, percentages will add to more than 100.

Sources of Apples for Philadelphia Wholesalers

The distribution of shippers who supply buyers and agents (brokers and commission agents) in Philadelphia was the same as that of shippers who used

25/ "Distressed fruit" is a term commonly used by the trade to describe shipments which must be moved into consumption rapidly because of the condition of the fruit, lack of storage facilities, and other causes.

the various terminal-market outlets. Small and medium-size grower-shippers constituted the most frequent source of apple supplies to the commission agent.

Large grower-shippers and most shipping-point brokers were represented on the Philadelphia market by terminal-market brokers. Chain organizations reported that they obtained most of their supplies from growers and cooperatives either directly or through shipping-point and terminal-market brokers. Several chains maintained salaried representatives in specific growing areas to negotiate purchases. Chains that bought apples on the Philadelphia market from auctions, commission agents, and jobbers usually made such purchases to supplement their regular purchases.

Factors Considered by Shippers in Marketing Apples

When asked the factors considered in making a decision to sell apples, the shippers' immediate responses were very general, referring to the supply and demand for apples. However, further questioning revealed that the shippers considered a number of specific items when estimating supply and demand. Some of these specific items were more important than others to most of the shippers and are discussed in detail below.

Supply

Size of crop.--Most apple shippers think first of the size of the apple crop when estimating the supply of apples. From blossom time in the spring until the first cold-storage report appears in the late fall, shippers watch the development of the apple crop in their area and any available estimate of the volume being produced in other areas. They consider volume produced by varieties, qualities, sizes, areas of production, and the distribution of specific varieties between fresh and processing outlets. Also of importance is the maturing date of specific varieties in each region. The shippers use this information to determine the competition their fruit will encounter in specific markets. The degree of interest of shippers in the detailed breakdown of apple production by area, varieties, and so on, depends upon the individual shipper's nearness to large markets and the type and size of his business. For example, the average shipper in the Hudson Valley of New York sells most of his fruit in New York City. Accordingly, he is primarily concerned with annual production in areas that are normally a source of supply for that market. On the other hand, a shipper in Washington or West Virginia, both of which are large surplus areas, studies the potential supplies available to most of the major markets scattered over the Nation.

The sources of information most frequently cited by shippers for evaluating the size of the crop and supply of apples on hand were crop production reports and cold storage reports issued by the U. S. Department of Agriculture and the International Apple Association. Information obtained from trade publications, newsletters, associates, and personal observation is used to supplement and verify the official estimates (table 12).

Estimates of apple production are used before apples are harvested as an index of the potential supply of apples to be marketed and moved into storage. Monthly reports on cold storage holdings issued after December 1 are interpreted as representing the actual volume to be marketed through the remainder of the marketing season.

Storage holdings.--The volume of apples held in storage ranked next in importance to the size of crop as an indicator of the supply to be marketed. Shippers considered not only total volume in storage but also volume held by variety, size, and condition. This information is obtained from associates, from statistical reports issued by trade organizations such as the International Apple Association, National Apple Institute and Appalachian Apple Service, and from personal observations. Some of the shippers interviewed indicated that detailed information on condition and holdings by principal varieties in present official reports was inadequate and not timely enough to use in making marketing decisions.

Price and movement of apples at shipping point.--Many shippers use the fresh market price of apples at shipping point as an indicator of current supplies of apples available in specific areas. Prices paid by processors in producing areas are evaluated in relation to the effects such prices will have on the volume going to fresh and processing outlets. The movement of apples from shipping points is also used as a gage of potential supply from specific areas during the latter part of the marketing season. Information on shipping-point prices and movement of apples is obtained from daily Federal-State Marketing News Reports, from personal observations, from conversations with associates and customers, and sometimes from newsletters and trade publications. Most shippers indicated that newsletters and trade publications are not current enough to be of great value in making day-to-day decisions; their usefulness is primarily limited to the evaluation of trends in prices and movement.

Movement to terminal markets.--Shippers interviewed considered the overall movement of apples, as reflected by movement from commercial growing areas to a number of specific terminal markets and total movement from cold storage, as an index of current and future supplies. The individual shipper uses this information in deciding how much of his fruit to market immediately and how much to hold until later. Most shippers said that present available data on wholesale movement in terminal markets are inadequate because they do not show how many of the apples received in the markets go into storage. No indication of changes in quantities held in terminal-market storage is available except the cold storage reports. Another weakness cited is that present reports do not give complete coverage of truck shipments.

Wholesale prices in specific markets.--Wholesale price quotations in specific terminal markets are used as an indication of immediately available supplies in such markets. Most shippers said that price was a better indication of current supplies in a market than volume reports covering the same markets. However, this indicator is limited to some extent, since the activities of speculators in a market affect day-to-day wholesale market

prices. Information concerning prices is obtained from Federal-State daily terminal market news reports and from associates (table 12).

Some of the factors taken into consideration in evaluating the supply of apples, and percentages of shippers considering each one (as shippers reported in May-June 1958), are:

	Percent of shippers
Annual production	97
Volume in storage	89
Shipping-point prices	82
Shipping-point movement	73
Prices in specific terminal markets	64
Receipts in 39 terminal markets	61
Volume in specific terminal markets	44
Weather in commercial growing areas	43
Stock of processed fruits	42
Prices in terminal markets	41

Sources of information on the last four factors above are Federal-State market news reports, statistical reports issued by the International Apple Association and other trade associations, and conversations with customers and associates. Canning industry publications and other trade publications provide information on stocks of apple slices and apple sauce. Shippers obtain reports of weather in other producing areas and in terminal markets from daily newspapers, trade publications, television, or associates in a particular region or market.

Demand

Large shippers (grower-shippers and sales agents) interviewed generally analyzed the demand for apples as thoroughly as they did the supply of apples. Information obtained in conversations with other shippers indicated that most large firms in an area were looked upon as price leaders and their analyses and actions were followed closely by other shippers. Although all large shippers analyzed the demand for apples thoroughly, it was found that the emphasis that medium-size and small shippers placed on individual items varied by regions. Medium-size and small northeastern shippers, who are relatively near large metropolitan consuming areas and who are possibly in close personal contact with terminal-market buyers, place greater emphasis on items

affecting local and short-term demand than western and large eastern shippers. Western and large eastern shippers, on the other hand, who must reach out to greater distances for their market outlets and who have greater transportation costs, consider factors affecting the national demand for apples and the demand over the entire marketing season. Western shippers (excluding Idaho shippers) and large eastern shippers also store more of their fruit than the smaller eastern shippers who sell most of their fruit to processing and fresh-market outlets at harvest time. 26/ Consequently, the large eastern and western shippers generally consider such basic factors as general economic conditions of the country as a whole, purchasing power of consumers, number employed in the labor force, prices quoted by processors, volume handled by processors, and the rate of movement of apples into consumption at prevailing prices, when analyzing the demand for apples.

The relative importance of individual demand items considered by shippers and primary sources of information used are shown in table 13.

Price.--Large shippers generally serve as price leaders for all apple shippers. 27/ Their method of analysis is to compare statistics for the current year with those for previous years on size of the present crop, volume moving into processing outlets, keeping quality and condition of supplies on hand, inventory of processed stocks, composition of supplies by varieties and size, location of supplies, prices quoted by processors, and general economic conditions. In this manner, they estimate the opening price quotations and seasonal prices which they consider will move available supplies into consumption over the normal marketing season. The trend in daily shipping-point and terminal-market price quotations and in volume moved is taken as an index of current demand and is used to refine the initial analysis. Thus, large shippers seek the highest price which will insure the movement of the volume produced. Day-to-day and longer term marketing decisions are based upon such analyses of demand, considering the supplies on hand.

Some shippers located in areas in which apples mature early indicated that they "tested the market" for price with their initial shipments and watched daily price quotations closely to appraise the prospective demand for apples. Others said that the early-season price was a poor indicator of the demand for apples.

Retail prices and sales were considered by a few shippers in determining trends in demand. However, most of them found this measure only slightly useful because: (1) At present, their knowledge of retail prices and sales is practically limited to information from their brokers and limited observations of associates; and (2) retail prices do not fluctuate with wholesale

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26/ Idaho shippers who have limited storage facilities and sell most of their fruit during the harvest season are exceptions among western shippers.

27/ The price quotations of specific shippers in major producing areas were frequently referred to by other shippers interviewed as an index of the demand for apples.

Table 12.--Percentage of apple shippers using information from specified sources to estimate supplies, May-June 1958

Factors considered in estimating supplies	All sources	Federal-State reports				Trade association statistical reports and newsletters 1/	Other shippers	Customers
		Shipping point market news	Terminal market news	Crop production estimates	Cold storage reports			
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Annual production	97	---	---	70	---	64	36	---
Volume in storage	89	---	---	---	73	85	---	---
Shipping-point prices	82	66	---	---	---	51	51	38
Shipping-point movement	73	66	38	---	---	35	49	46
Prices in terminal markets	64	---	64	---	---	23	44	54
Receipts in 39 terminal markets	61	51	61	---	---	61	---	---

1/ Includes reports issued by International Apple Association, National Apple Institute, Appalachian Apple Service, and State Horticultural Societies.

Table 13.--Percentage of apple shippers using information from specified sources in estimating demand, May-June 1958

Factors considered in estimating supplies	All sources	Federal-State market news reports		Trade association reports, newsletters, and journals	Associates 2/	Customers	Personal observation	Newspapers, radio, and television
		Shipping point	Terminal market					
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Shipping-point prices	94	63	---	47	65	42	---	---
Shipping-point movement	82	77	49	61	69	---	---	---
Prices in specific terminal markets	76	---	54	42	48	58	---	---
Receipts in 39 terminal markets	64	---	50	43	52	64	---	---
National per capita income	58	---	---	37	---	31	25	40
Number in labor force	58	---	---	25	---	31	25	40
Prospective shipping-point prices	48							
Season of year	48							
Supplies of other fruits	44							
Holidays	44							
Price of other fruits	42							
Weather in wholesale markets	34							
Retail sales	14							

1/ Sources of information on the first 6 factors only are given; percentages of shippers who used the various sources for the other factors were so small as to be meaningless.

2/ Includes other shippers, terminal-market brokers, and commission agents.

prices. Another weakness frequently voiced by shippers was the lack of adequate statistics on retail movement and prices. Most shippers said or implied that any price statistics without corresponding movement statistics were not useful in determining the demand for a product.

Most shippers pointed out that one of the best indicators of current demand for apples during the marketing season was the activity of buyers and the intensity of buyer bidding. For example, if frequent inquiries and bids are received from buyers, shippers expect an increase in the movement and price (demand) of apples; whereas, the absence or slowing down of bids or inquiries denotes a decline in the movement and price of apples.

The main sources of price information used by shippers included Federal-State market news reports (shipping point and terminal market), associates (including terminal-market brokers), customers, and newsletters published by trade associations (table 13).

Rate of apple movement.--The rate apples are moving into consumption, as reflected by movement at specific points in the channels of distribution, is considered to be one of the most important indicators of demand (table 13). Large shippers generally placed greater emphasis on the rate of movement than any other single item in analyzing the demand for apples. However, like other apple handlers, these shippers considered the rate of movement in relation to prices.

The chief items used by shippers to indicate the rate of movement of apples into consumption include rail and truck receipts in specific markets, disappearance from storage holdings, and shipments from growing areas. Shippers recognized and pointed out weaknesses in each of these measures. For instance, rail and truck receipts show only the volume of apples received in specific markets; thus, no indications of the volume shipped out of the market or, of more importance, the volume which may go into terminal-market storage, are obtainable from these data. The chief weakness of data on disappearance of apples from cold storage is that such data are not available soon enough to be of maximum value to shippers in appraising the movement of apples into consumption. Shippers as well as buyers pointed out that reports showing movement from growing areas did not include truck shipments in some areas, and incomplete coverage of truck shipments in other areas. This was considered to be particularly disadvantageous since transportation by truck is increasing from all important commercial apple producing areas.

The sources of information used to evaluate rail and truck receipts in specific markets are U. S. Department of Agriculture terminal market reports, which include summaries of rail and truck receipts in 39 markets. Information concerning disappearance of apples from cold storage is obtained from monthly cold storage reports issued by the Department of Agriculture and the International Apple Association.

Daily shipping-point market news reports issued by the Department of Agriculture include summaries of rail shipments from principal shipping points

and information on truck shipments from some of the important commercial producing areas.

Per capita income and number employed.--Per capita income and the number of the work force gainfully employed were given by most large shippers as an indication of the purchasing power of consumers and as an index of general economic conditions. The effect of unemployment in such cities as Detroit during the marketing season preceding the time of interview probably emphasized the importance of these factors to the shippers. In any event, many shippers stated "consumers cannot buy an apple to go into the 'dinner pail' if they do not have a job." Information concerning levels of unemployment, per capita income, purchasing power of consumers and general economic conditions are obtained from newspapers, magazines, newsletters, and papers published by trade associations, and from personal observations and conversations with associates and customers.

Miscellaneous items considered in evaluating demand.--Other items were mentioned by shippers as affecting the demand for apples but were of secondary importance to most shippers (table 13). Such items included preferences of specific markets as to variety, size, and grade of apples; supplies and prices of such competing fruits as citrus or pears; the influence of holidays; season or time of year; and intensity of promotion for apples and other fruit. Sources of information used to evaluate these factors included knowledge gained from personal experience, associates, trade papers and newsletters, and customers.

Factors Considered by Wholesale Apple Sellers and Buyers in Philadelphia

Philadelphia wholesalers often referred to the "feel of the market" in explaining how they arrived at the price they would ask or give for apples. "Feel of the market" can best be defined as the impression that results when the wholesaler mentally correlates a number of supply and demand factors and conditions which, through years of experience, he has learned to associate with fluctuations in apple sales and prices. His decision to buy or sell apples is based on this impression. The thoroughness and scope of the wholesaler's analysis appeared to be related to the type and size of the business operated. The factors considered by these agencies are shown in tables 14-17, and sources of information used in evaluating the principal factors are shown in tables 18 and 19.

Terminal Market Brokers

The terminal market broker is the representative of shippers or buyers in making sales or purchases. He acts as directed by his client. 28/ Essentially, the broker sells his knowledge of the market and his services

28/ The unit for apples is generally carloads or carlot equivalents in case of truck shipments.

for a fixed fee per unit handled. 29/ Since a broker is in competition with other brokers on the market, the volume of fruit he handles depends not only upon how well he performs services related to actual sales in the market, but also on the advice and market information he furnishes his clients. Therefore, his analysis of the market is thorough and similar to that of the large shippers described in previous sections.

Commission Agents

A commission agent's operation is quite different from that of a broker. He takes physical possession of the fruit consigned to him and sells it as if it were his own. He deducts his commission, selling, and other expenses from the gross returns of the sale and remits the remainder to the shipper. He is paid a percentage of the selling price for his services. Therefore, it is to his interest to obtain the highest price possible. The commission agent normally deals in smaller lots than the broker; that is, he makes sales in the unit or multiples of the unit in which the fruit is packed (bushels or boxes for apples). He also generally handles more commodities than the broker, as his customers are frequently independent retailers buying several items in small lots. The commission agent at times buys specific varieties or qualities of apples to furnish his customers fruit they desire. At such times, he becomes a merchant. He also may purchase small residual unsold lots of a shipment to make prompt remittance to his shippers.

Fruit handled by commission agents is generally received from small and medium-size shippers in nearby growing areas, and it is generally sold within a short time, that is, 1 or 2 days after it is received. The commission agent may also handle "distress shipments" of fruit consigned to him by large eastern and western shippers seeking a sales agent who can mininize losses on such merchandise. The commission agent maintains contact with his regular shippers and advises them on market conditions. However, the volume he receives from shippers may vary considerably from day to day due to the decisions of the shippers who regularly ship to him and the irregular shipments received from other shippers. 30/ Thus, since he does not have the flexibility of diverting fruit to other markets, and is primarily responsible for selling the fruit he receives to the best advantage in the market in which he is located, his operations are geared to a rapid turnover. Under these conditions it is understandable that he is chiefly concerned with the supply and demand factors affecting day-to-day prices.

29/ Technically, a broker is an intermediary between sellers and buyers. He does not take title or physical possession of the produce sold or purchased. He merely brings buyers and sellers together and is paid a fixed fee for his services. Normally, a broker deals in relatively large lots.

30/ Most shippers prefer to sell apples f.o.b. shipping point or on a delivered basis, thus avoiding some price uncertainty and cost incurred with consigned shipments or shipments for sale on arrival. Consequently, the commission method is largely a second-choice outlet and not used consistently when favorable prices can be obtained otherwise.

Table 14.--Percentage of apple wholesalers considering specified factors in estimating the national and potential local supply of apples, Philadelphia, Pa., June-July 1958

Factors considered in estimating supply	Type of wholesaler		
	Commission agents	Terminal-market brokers 1/	Chain buyers
	Percent	Percent	Percent
Volume in Philadelphia	86	100	100
National production	86	82	100
Shipping-point movement	71	64	100
Shipping-point prices	64	64	100
Volume in storage	57	64	100
Price in Philadelphia	50	45	40
Quality, condition, and size of apples	36	36	80
Movement in other terminal markets	21	36	60
Weather in growing areas	28	9	40
Prices in other terminal markets	2/	18	60
Time required to receive shipments 3/	2/	18	40

1/ Includes buying and selling brokers.
2/ Not considered.
3/ Time required to receive shipment from shipping point and other diversion points.

Supply.--The most important supply factors to an individual in this group are the supplies in his warehouse and the volume held by other wholesalers in the market. Next in importance are factors associated with the potential volume of apples that will be on the market during days immediately following, such as the size of the crop, movement and prices, and the volume held in storage in nearby areas from which he draws his supplies. The movement, prices, and volume held at other diversion points (terminal markets) and the volume offered on terminal auctions were of minor importance to commission agents (tables 14 and 15).

Table 15.--Percentage of apple wholesalers considering specified factors in estimating the current supply of apples in the Philadelphia market, June-July 1958

Factors considered in estimating supply	Type of wholesaler		
	Commission agents	Terminal market brokers 1/	Chain buyers
	Percent	Percent	Percent
Firm inventory	71	27	20
Inventory other Philadelphia wholesalers	57	45	20
Rail and truck receipts and on track holdings	21	82	100
Auction offerings	2/	72	80

1/ Includes buying and selling brokers.
2/ Not considered.

Table 16.--Percentage of apple wholesalers considering specified factors in evaluating the national demand for apples, Philadelphia, June-July 1958

Factors considered in estimating demand	Type of wholesaler		
	Commission agents	Terminal market brokers 1/	Chain buyers
	Percent	Percent	Percent
Wholesale prices in Philadelphia 2/	100	91	100
Movement from wholesale outlets	93	82	100
Movement at shipping points	43	82	100
Prices at shipping points	43	64	100
Season of year	36	54	60
Influence of holidays	28	45	40
Price of other fruits	7	54	60
Supply of other fruits	7	54	60
Retail sales	---	18	60

1/ Includes buying and selling brokers.
2/ Wholesale prices in Philadelphia are used as an index of wholesale prices in other terminal markets.

Demand.--Commission agents are chiefly concerned with factors that affect short-term changes in the demand for apples. The primary considerations include daily movement and prices in the Philadelphia wholesale market by varieties and quality, and the activity of buyers as reflected by their number and the intensity of their bidding (tables 16 and 17). Special attention is given to the presence and the activity of chainstore buyers in the market area, since these buyers normally purchase the majority of their supplies either directly or through terminal-market brokers and do not normally buy on the local market, unless retail demand has exceeded expectations or sufficient quantities of desirable apples are not available elsewhere.

Table 17.--Percentage of apple wholesalers considering specified factors in evaluating the demand for apples in the Philadelphia market, June-July 1958

Factors considered in estimating demand	Type of wholesaler		
	Commission agents	Terminal market brokers 1/	Chain buyers
	Percent	Percent	Percent
Weather conditions in Philadelphia.....	28	45	100
Firm (company's) sales.....	43	18	60
Competitors' sales.....	36	27	---
Auction sales.....	7	45	20

1/ Includes buying and selling brokers.

Sources of information.--Commission agents rely upon conversations with associates on the market, company records, personal observations, and conversations with shippers as their chief source of information concerning current supplies and (except for talks with shippers) current demand (tables 18 and 19). Conversations with shippers, crop production reports, and cold storage reports are sources of information used in evaluating the long-term supply of apples that will be available on the market. The Federal-State daily shipping-point report of movement and prices, and the Philadelphia terminal-market reports, are used primarily to check information obtained by observation and in conversations with associates.

Chain Buyers

Except for minor variations, it was found that chainstore buyers considered the same factors in their analysis of the supply and demand for

apples that were considered by large shippers and brokers (tables 14-17). However, the objectives of the chain buyers are quite different from those of the brokers and shippers. Chainstore buyers make their analyses to determine the lowest price at which they can obtain the volume of fruit they need; whereas brokers and large shippers make their analyses to determine the highest price at which they can move the supplies on hand. Chain buyers and large shippers each are in relatively keen competition with other firms. The volume handled by the large shipper is such that he needs several outlets, and he must compete with other shippers for these outlets. Similarly, the volume requirement of the chainstore buyer is such that he must draw his supplies from a number of sources in competition with other buyers.

Supply.--The most important supply factors to Philadelphia chain buyers were total apple production, price and movement in growing areas, volume in storage, and volume of apples in Philadelphia. Other factors considered by these buyers included: Movement and prices at other diversion points (terminal markets), weather in growing areas, and wholesale prices in Philadelphia (tables 15 and 16). It appeared that the primary interest in supplies and prices in the Philadelphia market was for comparison with conditions in growing areas where most apples are purchased.

Demand.--Chainstore buyers were generally interested in factors associated with the national demand for apples as well as factors reflecting demand for apples in Philadelphia. Their chief concern with demand factors outside the Philadelphia market was the indirect effect such factors would have on available supplies and prices in Philadelphia. Included among such factors were: Apple movement and prices in growing areas; quality, size, and condition of apples; price and supplies of other fruits; season (or time of year); and the influence of holidays (table 17). The most important factors considered in analyzing the demand for apples in the Philadelphia market included: Wholesale prices and movement, weather, and retail apple prices and sales in Philadelphia (table 17).

Sources of information.--Chain buyers utilized basically the same sources of information in evaluating supply and demand factors as the terminal-market broker (tables 18 and 19). These buyers relied upon the sales records of their companies' retail outlets and personal observations as an index of retail sales and prices in other stores. These factors were considered by only a few brokers and commission agents.

Appraisal of Wholesale and Retail Movement Reports

Shippers

The 1955-56 and 1956-57 wholesale disappearance and retail movement reports issued by the U. S. Department of Agriculture were remembered by 62 percent of the shippers interviewed in late spring 1958. By regions, the proportions who recalled these reports were 80 percent in the Northwest, 45 percent in the Appalachian States, and 38 percent in the Northeast. Other

Table 18.--Percentage of apple wholesalers using information from specified sources in estimating supply, Philadelphia, Pa., June-July 1958

Factor considered in estimating supply	All sources	Federal-State reports				Shippers and associates	Trade association statistical reports and newsletters 1/	Personal observation	Newspapers and trade journals	Firm records
		Shipping point	Terminal market	Crop production	Cold storage					
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Volume of apples in Philadelphia	93	---	57	---	---	---	---	100	---	---
Annual crop production	87	---	---	58	---	38	38	---	42	---
Apple movement at shipping points	73	77	---	---	---	23	---	---	---	---
Prices at shipping points	70	71	---	---	---	52	---	---	24	38
Volume in storage	67	---	---	---	75	45	35	---	45	---

1/ Includes statistical reports and newsletters issued by International Apple Association, National Apple Institute, Appalachian Apple Service, State Horticultural Societies and Apple Commission, and similar organizations.

Table 19.--Percentage of apple wholesalers in Philadelphia using information from specified sources in estimating demand, June-July 1958

Factor considered in estimating demand	All sources	Federal-State market news reports		Private market news reports	Shippers and associates	Personal observation	Company records	Personal experience
		Shipping point	Terminal market					
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Wholesale price in Philadelphia	97	---	90	41	---	48	---	---
Wholesale apple movement in Philadelphia	90	---	52	---	---	78	44	---
Apple movement at shipping point	67	75	20	---	50	---	---	---
Prices at shipping point	60	83	---	---	61	---	---	---
Season or time of year	47	---	---	---	---	---	---	79

shippers, as well as shippers familiar with the movement reports, were asked for their appraisal of the usefulness of such information in reflecting the demand for apples and as an aid in making marketing decisions. Sixty-six percent of those replying felt that the movement information was valuable.

The percentage of shippers who reported that they used or would use similar reports on apple movement was greatest in the Appalachian and western areas (table 20). It is possible that the attitudes of the shippers in these areas were influenced by the relative distance the areas are from large consuming centers and by their inability to gain such information from direct observation or other first hand sources.

Table 20.--Distribution of Philadelphia wholesale apple buyers by type, and apple shippers by region, who remembered the wholesale and retail movement reports issued during the 1955-56 and 1956-57 marketing seasons, and those who considered this type of information useful, May-July 1958

Apple handlers	Remembered reports	Considered type of information contained in reports useful
	Percent	Percent
Philadelphia wholesalers:		
Brokers 1/	67	50
Chain buyers	80	40
Commission agents	69	33
Shippers:		
Appalachian	45	82
Northeast	38	62
Northwest	80	78

1/ Includes buying and selling brokers.

Many shippers pointed out the limitations of present reports (cold storage, and rail and truck receipts) in reflecting actual consumption of apples over a short period. They regarded reports covering wholesale and retail sales as a more accurate indication of consumer reactions to fresh apples. Most shippers who considered the wholesale and retail movement information released in the 1955-56 and 1956-57 marketing seasons useful likewise pointed out limitations of the value of the reports. They explained that for such information to be of appreciable value in their operations it would have to cover several major markets, and continue over several years. Inasmuch as these reports covered only one or two markets and only extended over 2 years, some shippers did not regard the reports as fulfilling the need for this type of information.

It appeared that the chief interest of most shippers was information concerning the actual volume and changes in the volume of apples held in important terminal markets. Shippers indicated that they were interested in the actual volume of apples moving into consumption rather than the volume received in important terminal markets.

Wholesalers

The 1955-56 and 1956-57 reports on apple movement at wholesale and retail were recalled by 73 percent of the wholesalers interviewed in Philadelphia. However, 90 percent of the wholesale handlers gave an appraisal of the value this type of information would be to them in their operations (table 20). Four out of 10 of these wholesalers indicated that reports on the movement of apples at retail and wholesale would be of some value in making marketing decisions. Some said that such information would be useful in indicating trends in consumption, while others simply stated that any market information is useful or that they always accepted such reports if they were free. Most terminal-market wholesalers qualified their replies by explaining that information on wholesale and retail sales in terminal markets is more helpful to apple shippers outside of the market than to a wholesaler, since an experienced person on a terminal market can judge movement into consumption from the activities of buyers. This attitude of wholesale dealers was supported by information obtained from shippers.

Need for Additional or Improved Market Information

Shippers and Philadelphia wholesale apple handlers were asked to appraise the adequacy of present sources of market news and the need for additional information in making marketing decisions. The response of each group seemed to be closely associated with the type of operation carried on by each group, and the ability to obtain specific information from personal observation or associates.

The following percentages of wholesalers and shippers, interviewed in May-July 1958, said they would like more market information than is now available to them:

	Percent
Philadelphia wholesalers:	
Brokers 1/	18
Chain buyers	40
Commission agents	21
Shippers:	
Appalachian	54
Northeast	32
Northwest	52

1/ Includes buying and selling brokers.

Shippers

An average of 48 percent of the shippers expressed a need for additional or more detailed market information. A number of other shippers pointed out weaknesses and limitations in present sources of market information, thus indicating by implication that improvements were needed. Their chief complaints centered on the limitations of terminal market summaries of rail and truck unloads as an indicator of current movement of apples into consumption. A majority of shippers emphasized the need for information on current movement of apples into consumption and changes in terminal-market inventory holdings. They placed special emphasis on the effects of changes in terminal market holdings on wholesale apple prices, pointing out that they had made costly errors in appraising the demand for apples due to the lack of such information. They said that the most reliable source of information showing changes in terminal market holdings generally available to shippers is the monthly cold storage reports, which, however, are not current enough for maximum use. 31/ In explaining their need for this type of information, shippers expressed the feeling that the absence of this information placed them in a disadvantageous bargaining position with wholesale buyers, since buyers in terminal markets are generally immediately aware of such information through personal observation and daily contact with other buyers. This feeling was largely substantiated by the Philadelphia wholesalers in their appraisal of the value of the movement reports issued during the 1955-56 and 1956-57 marketing seasons. 32/

Another item of needed information pointed out by this group, especially eastern shippers, was the volume and destination of apples shipped by truck from commercial growing areas. A number of these shippers also emphasized the need for price quotations, to be accompanied by information on volume of sales. Apple shippers generally tend to discount price quotations because they feel that persons furnishing such information to reporters exercise some discretion in choosing the prices they quote. As a matter of fact, most criticism of the accuracy of various Government reports was in terms of the original information obtained from the trade. Hence, it is felt that reporting volume as well as price would help to minimize some of the misconceptions arising from present price quotations alone.

Other suggestions for improved reporting to aid shippers in their marketing decisions included: Expansion of the number of markets covered in the Federal-State market news reports of rail and truck receipts (from the present number of 39), more detailed information on fruit being sold at

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31/ Cold storage reports are issued by the U. S. Department of Agriculture on the 15th of each month covering cold storage holdings of specified commodities as of the end of the preceding month. The International Apple Association issues a similar report on the storage holding of apples on about the 10th of each month.

32/ See page 51.

auction, and a detailed breakdown of production estimates and cold storage holdings by varieties, qualities, and sizes.

Terminal-Market Handlers

Only 23 percent of the wholesalers interviewed expressed a need for additional market information to aid in marketing decisions. The suggestions that were made chiefly concerned more complete coverage of potential supplies and movement of apples into the market. The suggestions included: Information on direct truck shipments to chains, jobbers, and retailers; information on volume and destination of rail and truck shipments from commercial growing areas; and a comparison of current season movement with comparable time periods in previous years.

APPENDIX

Table 21.--Method of allocating 41 stores to be observed during selected periods of customer activity, Philadelphia, 1956-57

Items	Periods of customer activity in 41 stores			
	Busy	Medium	Slow	Total
1. Hours per week	924 hr.	608 hr.	658 hr.	2,190 hr.
2. Optimum length of observation periods (from previous year's study)	3/4 hr.	1-1/2 hr.	2-1/2 hr.	---
3. Number of sampling units (item 1 ÷ item 2)	1,232	405	263	1,900
4. Variance time period (estimated sampling errors of time period from previous year's study)	9.06	3.67	1.94	---
5. Number of sampling units x variance of time periods (item 3 x item 4)	11,162	1,486	510	13,158
6. Percentage distribution of sample ($\frac{11,162}{13,158}$ $\frac{1,486}{13,158}$ and $\frac{510}{13,158}$)	84.8	11.3	3.9	100.0
7. Theoretical allocation of stores (percentage distribution x 41 stores)	35	5	1	41
8. Actual allocation of stores (theoretical allocation adjusted to insure representation of different store sizes in all periods of customer activity)	31	5	5	41

Table 22.--Distribution of total number of sampling units in universe, number of units in sample, by stratum, and weight of each stratum, Philadelphia, Pa., 1956-57

Kind of data and classification of stores	Weekly sales	N_i	n_i	w_i (percent)
Audit:				
Small	Less than $1,000	2,240	26	7.44
Medium	$1,000-$6,000	1,190	28	3.95
Large	Over $6,000	70	5	.23
Observation:				
Busy	Over $6,000	17,248	31	57.30
Slow-medium	$6,000 or less	9,352	10	31.07
Total	---	30,100	100	99.99

N_i = total number of sample units in universe in each stratum.
n_i = number of sampling units selected from each stratum.
w_i = weight of each stratum--$N_i/30,100$.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1959 O - 511801